PC PILOT

A BRAND NEW HEAVY

747-400 Pro takes
to the skies

THE WAIT IS OVER

We're on a mission
with B17-II
at last

LOOKING FORWARD
TO THE PAST

A history of combat
flight simulations

HIGH 'G' HEROICS

Aerobatics explained

ONE GIG FOR UNDER
A GRAND?

Upgrade on a shoestring

EMERGENCY!

In a panic with
767 Pilot in
Command

PLUS ALL THIS INSIDE:

Ultimate Airlines • Battle of Britain • Corporate Pilot • Airfix Dogfighter
Combat Aces • Joysticks • Combat Squadron • BBMF • and more...

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A New Year Revolution

So, a new year begins and our thoughts turn to how many cliches we can get away with, using the theme of '2001 A Space Odyssey'.

One interesting point to consider for Odyssey Year, is the future of the Internet and how the changes that are imminent in the dot.com world will affect flight simulation. In the UK, Christmas 2000 was wildly trumpeted as the one that would 'make or break' Internet shopping. Well, the British public preferred to get jostled in crowds and stagger home from the shops with their presents, using the failing railways or the congested roads. They chose this as an alternative to the 'convenience' of shopping online. The convenience of placing an order at givusyourcash.com and waiting in vain for three months for it to arrive. The convenience of missing Christmas, having a carrier drop the long awaited goods down six flights of stairs before delivery and finally getting a credit card bill that shows you appear to have spent $10,000 in Bangkok, when you haven't been further from home than Brighton. There were some glum faces describing the failure of the UK to indulge in an online spending frenzy, but many of the pundits seem to have forgotten that mail order shopping was perfected during the reign of Queen Victoria. The arrival of the Internet doesn't make it any more or less convenient.

So how do we all become dot.com millionaires if shopping down a modem is no good? It's only a matter of time before hungry eyes will turn towards sites that offer information, news and special interest content to a target group of enthusiasts (sound familiar?). With this in mind, we were interested to see that www.combatsim.com has gone over to full access by subscription. Reading Doug Helmer's explanation on the site, it seems their decision was met by some fairly offensive remarks from a few corners, but has been generally accepted by the majority of regular visitors. It's our view that this will be the way many 'special interest' websites (not just in flight simulation) are bound to go.

When the site starts becoming a full time occupation, you won't pay your wages with advertising. Very few companies actually pay for web ads any more, especially to smaller sites, as there's little evidence for a return on the investment. If you're going to provide a download facility, you'll need a lot of server space, and that won't be free. The more you look at it, the more it becomes obvious that websites with good content will go the same way as TV stations. The ones that offer the latest films and sport tend to cost money and the ones that they bundle in free are usually peppered with repeats or topless darts.

So, gazing into the PC Pilot crystal ball this year, we predict that 2001 will probably see more sites going over to subscription and there may (sadly) come a day when the free site with a huge selection of news, information and downloads is consigned to history. It's what they call progress.

Dermot Stapleton
derm@pcpilot.net

COMMS

NEXT ISSUE: We'll be changing our publishing schedules over the next few weeks, so Issue 10 will be posted out to subscribers on 9th April.

Corporate assistance required

FROM: Paul Wilson

I'm very surprised to be writing to you today to complain. I recently purchased a copy of Corporate Pilot by Abacus. This add-on is far from special. For example, when applying left aileron, the spoilers deploy at a proportional amount and there is no 'NAV' button on the panels.

I have e-mailed Abacus and I got no reply, can you help me? I know nothing about editing the flight dynamics or .air files.

We reply:

Coincidentally, we were reviewing Corporate Pilot when Paul sent his mail, so our reviewer, Joe Lavery, did some investigations. Joe writes: "We investigated Paul's problems and it seems that Abacus have fixed them, so it's a pity they didn't reply to his mail. There is a new patch available free on their Web site at:- www.abacuspub.com/cp/cpfaqs.htm#update.

The LNAV & VNAV functions now work, meaning that the data is passed correctly to the autopilot. Without these, as you rightly say, the FMC is practically useless. I have limited experience of corporate jets, but my old instructor is now a captain for BA flying the Embraer 146. He informs me that the spoilers on some jets are designed to partially engage when banking at high altitude. This is to overcome the problems associated with over handling that can occur when using ailerons in the thin air at these levels. So it would appear that the Abacus team have perhaps done their best to simulate this effect."

Free for all

The Editors Rant in Issue 8, about why we don't feature much freeware on the cover CDs generated far less response than we expected. Peter Dowson offered us all his freeware utilities (thank you Peter) and you'll find these on the CD. We got a (slightly) strange mail about our Nazi/Communist attack on pay per download sites (no we couldn't understand that one, either) and two mails putting the other side of the debate, which are published below:

FROM: John Bell

What is your problem? Authors of Freeware can choose where they like to make their labours available. Most are perfectly willing for INDIVIDUALS to pass on their product, but get a bit wary when a commercial organisation asks to be able to distribute it. As you say, many have fallen foul of a certain individual, who is on record as saying Freeware should be done away with.

You wish for some reason of your own, to exaggerate the cost of downloading Freeware. Your privilege, but you are misleading us! It doesn't take 2 hours to download files. I downloaded 2.7Megs of DHC Beaver from flightsim.com over Christmas weekend in 20 minutes and my system is not supersonic. If you make your ISP your Best Friend under BT's Friends and Family scheme, the phone bill won't break you. Also, when you go shopping for bargains in the real world, you tend not to include the cost of the journey when you judge how much you have saved, or even come home empty handed. Nor with a cover price of £4.99, could your CD actually be considered to be free.

When I started to Flight simming in 1991 using FS3, I wasn't online, nor were there any mags like yours for me discover what add-ons or Freeware were available. In '93 I sent some of my own scenery and aircraft files to a certain PC magazine for them to include on their cover (3 ½" floppy) disc and they weren't interested.

I suspect that these days the majority of your readers are online. They need to be just to get the patches necessary for the latest versions of at least two of the big offerings. These are the files that require long download times (50+ minutes in one case). Microsoft don't even zip their patches - what you download is an executable file.

So come off it! The Net and the freeware on it are what make the flight sim fraternity grow worldwide. I would have given up long ago, if I hadn't been able to expand the boundaries of my out of the box FS world. I learned about your mag from the Net, like many others did; so don't knock it and the phone company, be thankful.

We reply:

What can we say? Over to the readers – do we exaggerate the cost of downloading? One large ISP makes no secret of the fact that their download rate slows over time until the connection drops out. Anything more than 10Mb is impossible. However, we certainly aren't attacking freeware or the Internet and we're surprised that 'a certain individual' wants freeware done away with – wherever would he get his products from?

FROM: John B. Hansen

I read with growing disbelief your letter in this month's issue of PC Pilot. I have been a well satisfied reader of the mag from day one, I am also a regular user of freeware, I started using it, quite frankly because there wasn't much else around. This has changed and I now find that I can purchase excellent add-ons, which are good value for money.

Now to the point, the authors of freeware own their creations, and as owners they have every right to say what happens to their property, they usually offer it freely with minor restrictions.

Your magazine however, does not offer the software freely. If I didn't spend £4.99 on your magazine, would you give me the 'free' software if I asked? No you would not!

This is the point I think the freeware authors are making, your disk is not free, it costs £4.99, and the publishers are making profit from other people's work. I am not a freeware producer, only a user, I am incapable of producing any form of software, but I am very grateful to those who allow me to benefit from their time and effort.

In conclusion I am of the opinion that your attack on freeware authors was nasty and unwarranted, and certainly not in the Christmas spirit. You should look to what you (and all of us) have gained from these unselfish people and give thanks, not criticism.

I hope you will find space in you next magazine to print my letter, or at least an apology to the freeware authors you attacked.

We reply:

The editorial was never meant as an attack on freeware, merely on those few that couldn't give us the courtesy of a civil answer when we asked to include their items. We certainly don't make any profit from the CD. The magazine costs readers the same with or without the CD and the CD costs us good money to create and produce. If we upset anyone unduly with our comments, we apologise unreservedly, but we do make requests on behalf of our readers and if we get a rude reply, then is it surprising that we feel the need to take issue?

Helicopter Help

FROM: Geoff Charge

Could you tell me where to find which keyboard controls I need for the CYCLIC and ANTI-TORQUE PEDALS when trying to fly the Chinook in RAF 2000? I have looked at the Flight Simulator 2000 help files on the Bell Jetranger but only collective and throttle are mentioned. The Chinook fuselage just rotates around the rotors !

We reply:

We get many letters and mails about the poor level of support from many suppliers, so we mailed Just Flight (anonymously) with Geoff's question. Paul Holmes of Just Flight's Customer Support department replied the same day: "Dear Sir, thanks for the mail. Turn off the Numlock and use the keypad. The zero and enter keys control the anti torque and keys nine and three will get you up and down, Keys eight and two handle forward/back, while four and five control left/right. If you want separate rudder control you need to turn off the rudder/aileron link."

Dublin's fair city, anyone?

FROM: Darren Kinsella

Please can you tell me if there is any scenery available for Ireland, particularly Dublin, for Flight Simulator 2000? Keep up the good work. Great product.

We reply:

We checked with our chums across the water, in the PC Pilot's Club of Ireland and Ian Broni advised: "To answer Darren's question, there are at least two commercial products currently in development for Ireland. One will cover the whole of the country and include all the smaller airfields. There is another, which will have just the three big ones of Dublin, Cork and Shannon and this may be part of some 'UK' titled scenery package. Both of these should be available during this summer. There is also some freeware scenery being developed for Dublin - we currently have a beta copy and it looks very good indeed. This should be available in the coming month although I am not sure yet as to how it will be distributed - maybe keep an eye on our web page!" www.pcpilotsireland.com

NEWS

Fly! II -on it's way soon

Not to be confused with Fly!2K, the developers Terminal Reality and their publisher, Gathering of Developers have announced details of the sequel to Fly! They have told us that Fly! II will include even more detailed scenery than the original, better cockpits and improved assistance for beginners. Richard Harvey, the head programmer of Fly! II told us: "Flight simulation enthusiasts demand a certain level of realism, depth and accuracy from a general aviation experience. Given its superior technology, aircraft systems and features, Fly! II pushes the envelope in a way that will delight the flight sim community and entice new fans to this genre." It is expected in the shops by 'spring' this year. We can expect some new aircraft, like the Pilatus PC-12 Turboprop and a Bell 407 helicopter and an interesting feature that we noted in their press release was simulation of system failures and basic structural damage. A few cynics in the office suggested that certain simulations were experts at system failures, but we explained that these were to the aircraft, not the program!

Overall, it sounds as if Fly! II will be a huge improvement over the original and the screenshots we've seen so far look impressive. You can find out more from the G.O.D. website at http://fly.godgames.com.

New from nVIDIA

After nVIDIA presented us with the first GPU (graphic processor unit) they're now promising a programmable GPU called the NV20, which is said to be up to seven times faster than the GeForce 2 Ultra. However, it won't be a straight seven-to-one improvement. The NV20 will probably be about twice as fast with simple geometry and low complexity situations. However, where it will score over its predecessor, is in highly complex, graphical renditions (flight sims perchance?)

NV20 Performance Relative to GeForce2 Ultra

- Lots o' small triangles
  - Very complex geometry
  - High depth complexity
- 3X Mix of triangle sizes
  - Complex geometry
  - Medium depth complexity
- 2X Large triangles
  - Simple geometry
  - Low depth complexity
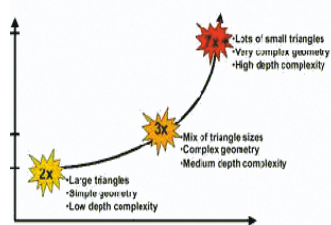
nVIDIA

Andreas Köhrer

It was with great sadness that we learned of the tragic death over the New Year weekend, in a road accident, of Andreas Köhrer, CEO and Webmaster of www.fsaustria.net. In common with many other organisations, PC Pilot would like to add our condolences to his friends and family at this difficult time.

Pilot's Assistant 1.6

Brian Tooby has advised us that there is a new release of this toolset (V1.6) available at: www.tooby.demon.co.uk/P_Assist _Home.html.

The main changes are:

1. Addition of a magnetic variations table.

2. Addition of fuel/performance tables for the Mooney Bravo, KingAir 350, 737-400, and 777-200. For details, please see the web page.

The Camels are coming

Hot on the heels of news about Combat Aces, which you'll find previewed elsewhere in this issue, we also learned about a site that its creator describes as "possibly the smallest FS community on the web". Simon Russell's site, The Aerodrome www.rusty100. freeserve.co.uk/the%20aerdrome is dedicated to World War One flying in Combat Flight Simulator. As Simon points out, he is part of a very select band. The WWI CFS community is small, but growing. There are only two squadrons on the net and less than ten WWI CFS dedicated sites. However, he isn't lonely and says that it's been good fun building up the community and he now runs an e-newsletter, that goes out to nearly 100 people each month. The site concentrates on WWI add-ons for Combat Flight Simulator 1 and 2, as well as Flight Simulator 98 and 2000.

The Aerodrome

The WWI Aerodrome

The planes in Spain fly mainly over the plain

If you take a look at Ferdy Serena's very popular site, fsplanet.com, you'll be able to see some great shots form the new Madrid scenery that he's publishing for Flight Simulator 2000. As well as a highly detailed Madrid Barajas Airport, you'll also find much of the surrounding area re-created in great detail. Price is approximately £17 and you can get more details from www.fsplanet.com

Virtual politics

We often hear about new VA's starting up, but none of them as 'unique' as Republican VA. Andrew Jay told us: "Republican Airlines is a VA which is based on the Republican political party in the United States. We are in no way related. We fly with the purpose of brining all political parties together. We saw that there were many people on the web that we could influence and they could see that we support our party. We are still in the stages of building a stable foundation. Next step is creating our aircraft and logos, and adding a news section to bring political news to you. We hope that after the inauguration day for our president we can hold a fly-in and political debates." Hmm.... politics and flight sims should give rise to plenty of debates - anyone fancy joining Tony Blairways?

And the winners are...

There have been lots of lucky winners of our last two competitions. The superb Altec speakers were nabbed by Hans Vander Plaetse from Belgium and John Firth of Swinderby. Our congratulations to both of you and commiserations to the many others who entered. We've also had a huge response to the Maximum Flight competition from the last issue and we'll be advising the ten names pulled from the hat of their good fortune in the near future. In the meantime, we've got a slightly more academic prize this month. Have a look on page 45 for details of how to win a copy of the unique PC Pilot book. No relation to this magazine, but a collectors item nonetheless, this will be a fascinating read for anyone interested in the history of flight sims.

SOCAL 2001

Not much in the way of details yet, but Larry Williams has given us advance warning that that there is going to be a SATCO social event taking place in May at Palm Springs, California. It is open to all SATCO members and any one else who would like to attend. They are looking for commercial sponsors for the event who can either give products away, add influence by putting their logo on the SOCAL site or both. Interested parties can get in touch with Larry at sadde6@earthlink.net

FS Contests

We were pleased to hear from FS contests, the website for flight sim related competitions, that their first event has been a great success, with more planned for the future. If you're a flight sim enthusiast with a competitive streak, go to www.fscontests.com and you can take part in some of their regular competitions.

Tony Pentescost with a Delta 727-247 passing Mt. Rainier on approach into Seattle-Tacoma Intl. The screenshot was taken in Flight Simulator 2000 with FSClouds. Scenery: Washington State by Eddie Denney.

A shot of Fred Banting's De Havilland DHC-2 Beaver in a low altitude flight in Darrington (Washington), with scenery by Richard Goldstein. This winning shot was taken by David Tremoleda

Also among the winners was Joe Mundi with this Sunset departure from Chicago O'Hare. The aircraft is the PSS 777-200 in United colours with default Flight Simulator 2000 scenery and real world weather.

THE FREE CD-ROM

We've managed to pack quite a bit onto the latest free cover CD. For a little fun there's a demo of Airfix Dogfighter (reviewed elsewhere in this issue), as well as a bumper crop of shareware from SimMarkets, some free software from Flight One, as well as two of their most popular products that you can load from the CD and purchase online (much cheaper than downloading if you haven't got a free line). We've also included as many of the latest patches as we can find, some fantastic freeware, utilities and a few other goodies that should appeal to flight simmers everywhere.

CLOUDS, MORE CLOUDS AND AIRLINES

Flight One have kindly donated a free copy of Combat Clouds for Combat Flight Simulator and also included full versions of FS Clouds and Ultimate Airlines, that can be registered online from the Flight One website. To get the instructions for installing Combat Clouds and how to register the other software, look in the index file that you'll find in the Flight One folder. If you want to buy FS Clouds or Ultimate Airlines, you can install them from the CD and 'unlock' them once you've paid and registered at www.flight1.com.

THE ROGER DIAL GALLERY

Top freeware designer and generally all-round nice chap, Roger Dial, has kindly given PC Pilot the chance to put our favourite aircraft from his hangar onto the CD. Roger is one of the most skilled designers we know and you can check out all his work at www.thehangar.dogfighter.com. There's some fantastic aircraft in this collection, including our personal favourites like the Mustang, Thunderbolt and Mitchell, all in superb detail.

X-PLANE 5.54 UPDATE AND DEMO

Although it's now being published in the US by Xicat interactive, X-Plane is still updated on a regular basis. The latest full update for Windows is around 70Mb and we've also included the minimum version for Mac's. Remember, if you haven't got X-Plane, click on the X-Plane icon in this folder and it will run as a demo for five minutes.

AIRFIX DOGFIGHTER DEMO

Not strictly a flight sim, but many will assume it is, so here's a chance to have a quick whiz around and see what all the hype is about.
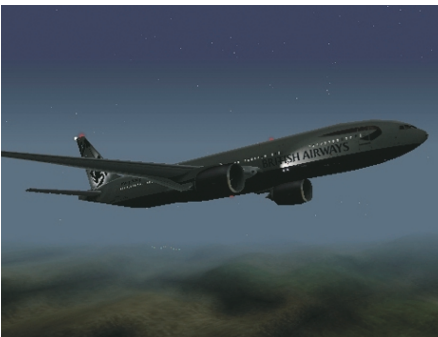
UTILITIES

If you like doing a bit of DIY with your flight simulator, you'll find a full version of the excellent Paintshop Pro and also Peter Dowson's excellent utilities for Flight Simulator, including FSUIPC that's featured in our downloads section. If you aren't sure how to use Paintshop Pro, look out for a feature in a forthcoming issue, when we'll get our sprayer out and do some customising with this excellent program. You'll also find regulars like Winzip and Adobe Acrobat. Please note that any shareware should be paid for and registered if you want to use it on a regular basis.

THE FAIRCHILD FLYING BOXCAR

In the Downloads feature in Issue 8 we featured Dean Reimer's first attempt at a freeware aircraft design. Many of you wrote to say how impressed you were, so Dean has kindly given us permission to include his aircraft on the CD. Be sure to have a look at the Readme files first, as they give very good instructions on loading and also some comprehensive background on the aircraft. If only they were all like this…

PATCHES

As well as most of the patches from previous issues, including those for FS2000, Fly!, Flight Unlimited etc., we've got the latest Flanker 2 patch (2.03), which should save your phone bill from a 30Mb mugging.

SIMMARKETS SHAREWARE

The chaps at SimMarkets have been busy over Christmas and you'll find some excellent shareware in the SimMarkets folder. For more details on the various programs on offer, have a look at www.simmarket.com

Your One Stop Flight Shop!

UK2000 1,2 & 3

We included this brilliant scenery package on the last CD, but forgot to include the website details to register. We've included it again and as it's being reviewed in this issue, you can see what we thought and judge for yourself. Microsoft's terrain has improved a great deal, but do those programmers know what UK airfield's look like in detail? Well, Gary Summons lives in the UK and has used local aerial photographs to make these stunning UK airfields come alive. Register at www.fltman.freeuk.com/public/index.htm

TUTORIAL CHARTS

As we're now regularly including a CD with PC Pilot at no extra cost, to ensure prices remain the same as when we launched in 1999, we've taken a bold step and decided not to include the tutorial charts on a printed card in this issue. However, we know how important these are if you're following the tutorial, so we've included a folder on the CD with the charts in it as high-resolution image files. They are in .jpg format so you can open them in Paint, or try out the new Paintshop Pro that's included on the CD. We've also embedded them in a Word document in a similar style to previous tutorials, so you can print them out in the same layout, if you want. Remember, these are the current charts as supplied by Jeppesen and the charts you'll see in the article are from Jeppesen's Simcharts program.
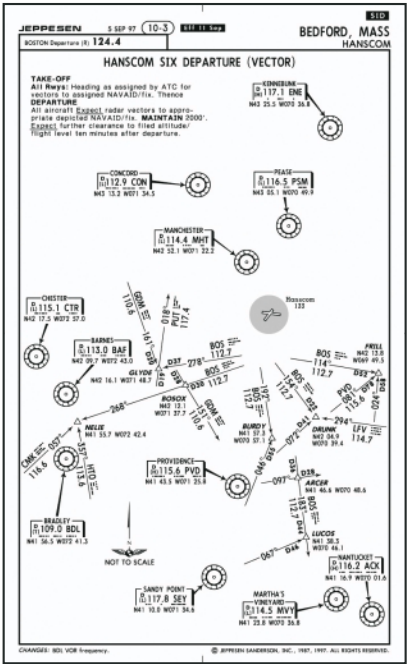
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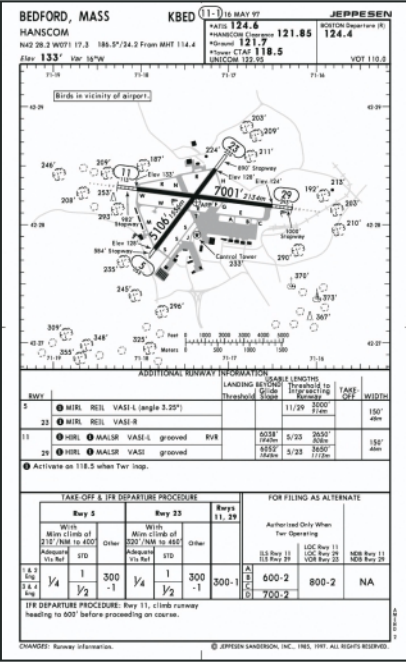
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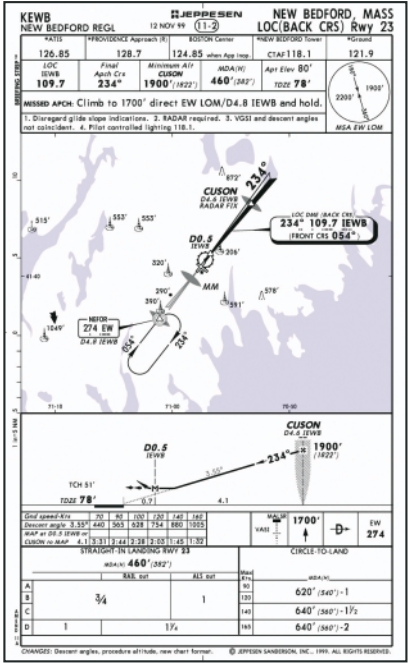
New Bedford STAR.jpg
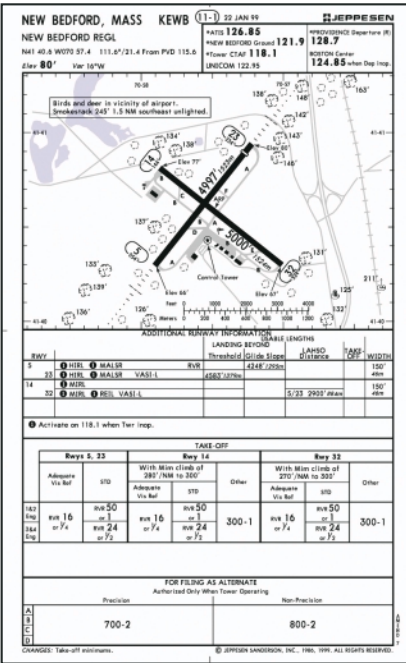
New Bedford Airport.jpg

IMPORTANT - TECHNICAL SUPPORT

The CD and software on it, with the exception of online registration and shareware files, is free and as such, PC Pilot, nor any of the publishers or developers of the software supplied on the CD can provide technical support. The software is supplied very much 'as is' and without support. Enjoy the CD and the software on it!

Plus ça change!

For our latest opinion we asked for the views of someone with a much wider perspective on the world of leisure software. Andy Payne is MD of the Producers Ltd, who design, manufacture and distribute for software publishers across the spectrum, from your favourite PC flight simulators to Playstation games. We asked Andy to give us his view from the production line.

Wednesday 1.25pm, my telephone rang and I was pleased to hear from my old chums at PC Pilot. After the initial cordialities, came the question - "we need a favour, can you help?" Reflex reactions, honed over 17 years in the software publishing business, made my answer obvious. "Of course", I said, typically without actually asking the nature of the 'challenge'. "We need you to write an 'Opinion' column for PC Pilot". An opinion, I mused, well, they came to the right place. "When do you need it?" I asked, "tonight by 6pm" came back the Piloteers…

Computers, consoles, challenge, corporations, consolidation, chain stores, consumers, choice, cost, customers………chaos. These are the c-words by which my daily working life is governed. The Producers, formed in 1988, works specifically for software publishers. Most of the time we provide simple solutions to complex problems, but from time to time we can supply complex solutions to simple problems. We design packaging and documentation, plan and execute media and advertising campaigns, print and produce component parts including boxes and manuals, press CDs, assemble finished products, store, warehouse, distribute, fulfil distributor, publisher and end user orders and report on the whole thing for our publishing customers. We have worked with great brands over the years, Empire (Flying Corps), Maxis (Sim Copter), Activision (F-14 Tomcat), Virgin (Flight Unlimited), Mission Studios (Jet Fighter series), Thalion (A-320 Airbus), Mallard (FS Sceneries), Sub Logic (ATP - Airline Transport Pilot), Lucas Arts (Battle of Britain), Mindscape (Wing Commander and Strike Commander), Novalogic (Comanche series, F-22), Domark (Mig -29), Eidos (Flight Unlimited II), Sierra On-Line (Red Baron, Pro Pilot), Microprose (B-17 & 'F' everything) and of course, Electronic Arts (Chuck Yeager to Jane's). Most of these brands or labels are now either owned by the new multi-national super publishing corporations, or have disappeared altogether.

This was the golden era of software publishing. Products were relatively simple, ran on less powerful machines, were no less reliable but above all were cheaper to produce and therefore less risky to bring to the world commercially. This resulted in more products and more choice. Sadly for computer gamers everywhere and flight simmers especially, those days look like being over. Witness huge and complex projects, developed way over budget, principally for the challenging PC platform and problems could be just over the horizon. Flight simulators have fallen to the butcher's knife within an increasingly dumbed-down market place. The Sony Playstation has been the single most important factor, the real long knife in the flight sim massacre. Publishers, many of them now faceless 'euro'-conglomerates, have taken a formulaic approach. Products need to be world wide successes, mass market, cross promoted, easy to plug and play and above all youthful. If a product cannot sell one million units across all territories, it is unlikely that it will see the light of day at all. Publishers want less risk. Just like the film business, sequels are a safe bet. Special effects sell. Just like TV, simple plots and timeless themes are mass market. Flight sims are simply not perceived to be the equivalent of Coronation Street or Friends. Flight sims are BBC2 - detailed, specific, targeted and above all, niche.

Playstation… the real long knife in the flight-sim massacre

Given this prevailing thinking, it is unsurprising to see Microsoft pretty much monopolise the fallout. Their hugely popular Flight Simulator, 16 years on and with a sequel or upgrade every two or three years, has backed into the space to such an extent that the term 'flight simulation' has become synonymous with their product. This ever decreasing circle means any competitor will inevitably be compared with the de facto benchmark and runs the risk of failure (see Pro Pilot and Fly!). So what happens? Less flight simulators and thus, less choice.

At this point enter the retailers, the most expensive link in the value chain (from developer to consumer) and the real reason why software costs what it does. What value do these chain stores bring? Product knowledge, customer service and great choice? Well, they offer great 'discounts' off manufacturers (publishers) retail prices so I suppose they bring consumers better value. However, when you work on the inside you get to know where the real power is. Just like everywhere else, the retailers command huge margins (typically 50-55% discount off RRP), take no risk at all - every product is on sale or return - and actually charge publishers for in-store promotions.

Don't for one moment think that the chain store is favouring a value for money product through heavy marketing. They are doing it because they charge for the privilege. If a publisher wants a store to stock their products they must pay, in one way or another. They quite literally stamp that price down.

With fewer publishers able to command the critical mass to actually achieve worldwide penetration, the retailers (themselves multi-national corporations) make less real choice available to the consumers. How often have you been able to pop to your friendly shop and actually order that product you have read about but cannot find? You are likely to be confronted by a youth in a ill-fitting shirt and tie, surprised you do not want to grab from the piles of computer products at 'crazy' prices and who's quick to tell you to get a console, which has more choice of games.

There is a way forward and that is for smaller publishers to fill the void, offering more focused products, sold direct to their customers who are the users, at a lower cost than is currently prevalent. Customer service is a prerequisite of any successful business, so any self respecting publisher should listen, act and above all respect the needs of its customers in order to flourish. Combine this with the power of the internet to inform and service a loyal fan base and there is light at the end of the tunnel. Flight simulators can return handsomely on their investment for publisher and consumer alike. There has to be a little lateral thinking and a risk taken now and again. Cut out the parasitic links in the chain. Is there ever progress without risk?
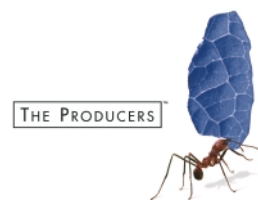
Andy Payne

Andy can be contacted by e-mail at andy.payne@the-producers.co.uk

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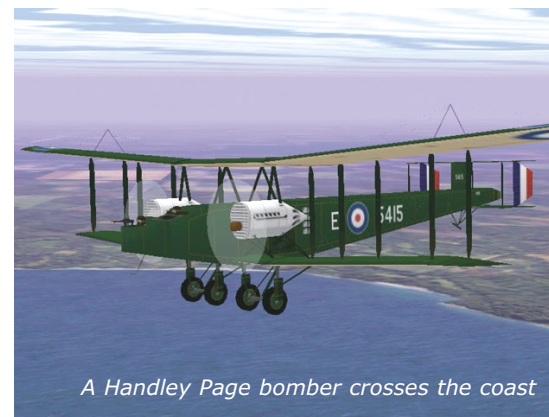
A Handley Page bomber crosses the coast

Combat Aces

Circuses, squadrons and escadrilles

"We met the Huns. My man gave me an easy mark. I was only ten yards away from him – on top so I couldn't miss! A beautiful coloured insect he was – red, blue, green and yellow. I let him have 60 rounds at that range so there wasn't much left of him… Rough luck, but it's war and they're Huns." Major Edward Mannock, VC, MC, RFC.

A cursory glance around the Internet will show that with a few notable exceptions, enthusiasts of First World War aviation are quite sparsely served by flight simulation. The WW1 Combat Flight Simulator web ring, hosted by www.wingsofhonor.com, only lists five sites and letters from our readers suggest that there is a keen interest in a product that combines the quality of Combat Flight Simulator with the subject matter of Flying Corps Gold or Red Baron. The nearest thing to this in the past was an add-on called Aces High, that was published a couple of years ago. Although beautifully produced, it was only compatible with Flight Simulator 98, which limited its appeal somewhat.

The Fokker Triplane cockpit – where the Red Baron rose to fame

However, there's the distinct clatter of a Bentley rotary and a whiff of castor oil emanating from the hangars at Alpha Simulations, the chaps that brought you Cold War Air Power. Their latest add-on for Combat Flight Simulator 2, Combat Aces, will have WWI fans struggling to pull their 'fug' boots on over their pyjamas and galloping across the grass at dawn to be first in the queue.

There will be 18 different aircraft in this collection – all different types we should add, not 17 Camels painted in various colours. We're promised nine allied and nine German aircraft and as well as the Camel, SE5, Fokker Triplane and Albatros that you'd expect, there are some less well known types such as the Handley page 0/400 bomber and the Siemens Schukert. We've even seen a few shots of a flyable Zeppelin airship with windowed gondola, animated propellers and its own shed. We were sorry to see that the RFC's workhorse, the poor old BE2C was not included, but it should be said that if this design had been omitted from the RFC's stable in 1914, there would have been a lot more aircrew still alive in 1918!

As well as a comprehensive aircraft fleet, there are to be 20 missions and some very detailed western front scenery for Combat Flight Simulator 2. The aircraft should be flyable in Flight Simulator 2000 without any problem, but it's unlikely to be compatible with Flight Simulator 98 or the original Combat Flight Simulator. From what we've seen so far, Combat Aces isn't going to lower the frame rates to an unacceptable level, which is probably just as well, because some huge dogfights look likely to take place. Budding aces will also have the opportunity to pit their skills against Manfred von Richtofen, or even take control as the Red Baron himself.

A Nieuport 17 takes on a Zeppelin R6 bomber

The Albatros DV panel – many a German ace saw this view

Combat Aces will be published by Just Flight and from what we've heard so far, they won't need to spend much on advertising. We were discussing the specs for this new program with a few WWI fans and all they said was "don't worry about the details, just tell us when we can buy it!"

It's not easy to follow that, so we'll let the Baron have the last word:

"I am a hunter. My brother Lothar is a butcher. When I have shot down an Englishman my hunting passion is satisfied for half an hour." Manfred von Richtofen

Derek Smalls

A Fokker DVII flies over the trenches

767 Pilot in Command

Experience the thrills of an airline captain
767
Pilot in Command

"Don't panic, Captain…"

For many commercial pilots, a flight simulator is often viewed as something far from entertaining and an experience that must be endured on a regular basis rather than enjoyed. This is because pilots are required to undergo frequent tests in the simulator to check their reactions to emergencies. Consequently, most of their time in these wonderful machines is spent wrestling with a crippled aircraft, knowing that an examiner is watching their every move to ensure that they follow procedure to the letter.

Wilco, building on original new gauges and panel details designed by active 767 co-pilot Eric Ernst and co-developers Laurent Crenier and Wade Chafe, have taken this nerve-wracking (interesting?) aspect of commercial aviation and created a program that transforms Flight Simulator 2000 into every pilots nightmare.

At first glance, you'll find yourself at the controls of an extremely well detailed Boeing 767, with state of the art controls and gauges. Initially, you are taken step by step through the procedures for flying this popular jet. The pilot, co-pilot and onboard instructor verbally interact as they go through each stage of flight, from

Uh-oh! Looks like trouble…

cockpit preparations to pre-takeoff, post-takeoff, cruise, descent, pre-landing and post-landing procedures.

Once you've mastered the control of the aircraft, the trouble starts. If you like to live dangerously, then you can select from a menu of failure scenarios and go through the motions of taming an airborne disaster. What do you do when you're halfway to your cruising altitude and your right engine suddenly gives up, or you experience a hydraulic failure?

After you're familiar with the checklist for each emergency during short flights with predictable failures that you've chosen yourself, you move on to a series of flights where any malfunction that is now in your repertoire can occur at any time. Replicating the checks that real-life pilots must go through to retain their licences, these adventures take place over both US and European terrain and they're designed to test your reflexes as well as your knowledge.

Wilco advise that for the first time, 767 Pilot in Command offers interactivity between the flight panel and the adventure. If red warning lights are flashing, for example, you can hear the instructor saying, "Captain, we have a failure on board, we need to follow the Engine Fire checklist". If your flight panel indicates that an engine has failed, the instructor will announce that "It's time to go to an alternate airport".

However, if you prefer a calmer flying experience or for days when you don't want to be reminded of your last close encounter with airborne calamity, the sim can also be flown without any failures and all the normal procedures of the 767 faithfully recreated.

We need to press one of these – fast!

Hold on tight… we're going down

An engine failure – that's all we needed!

This certainly sounds like a novel approach to flight simulation and one that will be very familiar to commercial pilots. We're looking forward to honing up our emergency procedures when it's released. ■

Derek Smalls

PREVIEW

Publisher:	Wilco	Price:	£24.99
Website:	www.wilcopub.com	Expected Release Date:	
Developers:	Wilco		Spring 2001

DON'T TAKE OFF WITHOUT US!

The Battle of Britain Memorial Flight

One of the BBMF's Spitfires on its way to a display

"Lest We Forget"

We in Britain are often accused of spending far too much time dwelling upon events in the past. However, a healthy knowledge of history might go some way towards helping future generations avoid the mistakes of their forebears. Whenever you look up at an air display and see the Hurricane, Spitfire and Lancaster of the Battle of Britain Memorial Flight passing overhead, as well as enjoying the site of some impressive aircraft you also get a subconscious reminder that war is probably something best avoided. These great machines are arguably more effective as a memorial than the traditional stone plinths and statues that you see in the street and walk past every day without a second glance.

The flight was formed in 1957 as the Historic Aircraft Flight and only became the Battle of Britain Memorial Flight in 1973. They are currently based at RAF Coningsby and the aircraft are flown and maintained by RAF personnel. The BBMF relies on many commercial sponsors and one of these is Just Flight. When we heard that they were

Not an illustration of the defence cuts, but Coningsby by day, as old rubs wingtips with new

The BBMF Dakota - bet you didn't know they had one!

planning a BBMF add-on for Flight Simulator, we thought there might be limited value in a three aircraft product (although this hasn't stopped some other publishers). However, after a bit of research on the BBMF, we found that they currently operate 12 aircraft (yes, it surprised us too) and, as well as the famous trio, there are another five Spitfires, another Hurricane, a Dakota and the last two operational Chipmunks in the RAF.

Just Flight have advised that the research on this project has been extensive and they say that this will be reflected in the quality of the aircraft. All 12 will be highly accurate and detailed, with custom sounds, instrument panels and gauges as well as animated surfaces and gear. Possibly a first for a flight simulation product, the models have actually been flown and tested by the BBMF aircrew to ensure that they are as accurate as possible. There's quite a team behind this venture, including Roger Dial, well known for his aircraft designs and the Blue Arrow group of RAF Collection fame.

Battle of Britain Memorial Flight should also contain highly detailed and painstakingly researched scenery of Coningsby, the BBMF's home base, including accurate building placement with opening hangar doors, accurate textures and navaids. This add-on is being designed from the outset to run with
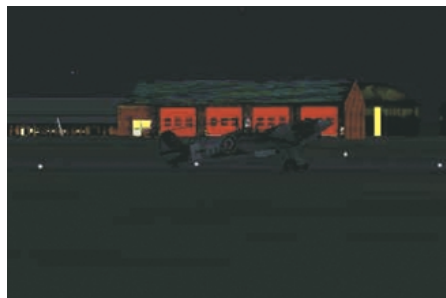
RAF Coningsby, home of the BBMF, at night

Mickey the Moocher - still impressive after nearly 60 years

Combat Flight Simulator 2, and Flight Simulator 2000. We're also promised missions for combat fans, but it sounds like an entertaining package for anyone who just wants to fly these aircraft that form such an important part of our heritage. In keeping with some other Just Flight products, a percentage of the proceeds will go towards helping keep these aircraft airborne as well as aiding those that flew them when there was more at stake than an entertaining display. ■

Derek Smalls

Real Airports

How real can you get?

Wherever you look these days, there seem to be huge numbers of additional airports available for Flight Simulator 2000. Freeware, shareware or commercial, for English, German, Asian and American locations – whatever and wherever your preference, there are always going to be some add-on airports available. To the casual observer, it may seem odd that there are so many extra landing places for a program that boasts "more than 20,000 airports". What can these developers possibly be offering? Small patches of grass in the Outer Hebrides used by smugglers or rubber mats laid out across Arctic Lakes? No, you'll find versions of international airports like Gatwick and Hong Kong to add on to Flight Simulator 2000 (to name just two). Unfortunately, as anyone who has ventured away from Meigs Field will testify, most of the '20,000 airports' are strips of grey with a couple of boxes littered around them. Hardly satisfactory for the claimed levels of

Orly – c'est magnifique, mais ce n'est pas le default!

Milan - a fashionable airport for the fashion capital

realism that Flight Simulator 2000 can support, so enter stage left the plethora of additional airports that are about.

In many cases you'll be offered a simple selection of airports and maybe some local scenery. However, commercial publishers have learned that the fact that it included no longer so easily extracted. The days when you could swap two musket balls and a quill pen for half of California or Australia are long gone and nowadays even virtual pilots need to be wooed with a few extra trinkets.

The latest airport offering to colonise our flight simulator world is Real Airports from Just Flight. The specifications are certainly comprehensive, although at first glance the fact that it included only six airports suggested its appeal might be limited. However, our initial trip around an early version of the program was definitely not disappointing. The airports included are London Gatwick, Houston George Bush Intercontinental, Zurich Kloten, Rio de Janeiro Galeao, Milan Malpensa, Cologne/Bonn Konrad Adenauer and Paris Orly. These are six of the busiest in the world and the level of detail that we've seen so far is fabulous. The development team are some of the best-known scenery designers around and they've estimated that Real Airports has taken them six man-years to create.

Static scenery abounds and we're told that all the airports will include runway and taxiway lighting, realistic ground markings, authentic-liveried aircraft, many different types of ground vehicles and even airport staff at some gates. Speaking of gates (no, not Bill) Real Airports will have active gate guidance boards to let you park right at the pier, plus, as your aircraft comes to a stop the passenger walkway arm automatically moves out to meet the plane!

We've become used to spectacular night lighting effects in scenery these days and Real Airports seems to be no exception. As an aside, we've heard from quite a few readers who prefer to conduct most of their flights at night, so some well-lit airports (with flood lighting on the aprons) should be welcome.

Zurich after dark – let there be light!

Zurich airport in all its glory by day

In addition to tarmac, buildings and lights, Real Airports will also have six new ATC adventures with voices from several countries and a unique video view from outside the aircraft while the crew do their pre-flight checks. Just in case you haven't got a good hangar full of suitable aircraft (maybe you run a budget airline) Just Flight have thoughtfully added five decent Airbus variants in a number of airline liveries.

No airport program would be complete without the requisite SIDs and STARs, and these are included in Real Airports as well as a full background on each airport in the collection.

Whenever we hear of a new scenery package that includes a superlative level of detail, we always reach for the PC with the 1GHz processor to ensure that Flight Simulator 2000 can stagger into the ether. However, the developers have advised that they have kept detail to a realistic level (apparently some of you want to fly around, rather than take screen shots) and the frame rate hit should be below that of Airport 2000. If you're looking for an all-in airport/adventure/aircraft package this sounds like it should fit the bill. ■

Mike Hodges

B17 Flying Fortress: The Mighty Eighth

The strategic air war arrives in virtual reality

Adolf Galland, the famous Luftwaffe General, commented in his book The First and The Last on the defensive power of a bomber formation: "A formation of 27 B-17s can bring to bear 200 heavy machine guns, with an effective range of 1000 yards to stern. On the other hand, according to experience, it usually took 20 to 25 hits with 20mm shells to bring down a Flying Fortress."

Most military simulations build a combat environment and then drop an aircraft or two into the scene. B17 simulates the Fortress itself, inside and out and then builds the combat environment around the living and breathing airborne community. With motion capture for the crew and detailed interiors, down to the rivets and the shadows, B17 blends action and role playing with a serious military simulation. The Fortress and the strategic air war leap out of history and into virtual reality!

"The fighters are our salvation, but the bombers alone provide the means of victory."
Sir Winston Churchill

The first serious B17 simulation was released in 1992 and some of the same principals were involved in that design as, in this latest incarnation from Hasbro.

On entering B17 you'll find yourself instantly immersed in a complete Flying Fortress. Sound effects, voice, special effects and moving crewmen contribute to a compelling experience on board the Fort. Voices of crewmen change with excitement, panic, or pain. Their actions are almost too human; you'll feel connected and won't willingly sacrifice them for the cause.

The artwork is uniformly excellent, with textures appropriate for aluminium, steel and wood given depth by moving shadows and a changing environment. Textures change with damage on virtually every surface in the B17. A hit in your engine may spread oil or flames across a wing. In the fighters leaking oil can smear your windshield.

The setup interface

The systems simulation is also detailed, down to the complexities of inertial starters and superchargers. Aircraft panels are completely interactive, with each button and switch for the pilots, navigator and bombardier actually performing their simulated function.

Outside the Fortress is a living combat environment. Cloud layers drift across the sky, casting shadows on the fields and hedgerows. The sun rises and sets, turning the sky amber then red. At the sea ports sea-gulls cry. Shifting winds challenge your navigator to fix your position, particularly when the clouds are heavy. Gazing through gaps in the cloud cover at the ocean far below you'll see whitecaps adorning the

B17 Formation on their way to a German target

This Bf109 has a serious oil leak

A harbour target in B17

This Crew has flown their last mission- the banner at the top indicates their status and it isn't good

The crew views panel allows you to shift perspectives

The icon rose interface lets you issue movement orders to your various crewmembers

The Squadron Commander's office. On his desk you'll find the crew, bomber and medical information files

surface. The light and shadows playing across the metal wing and fuselage of your Fortress may amaze you.

Below the surface, B17 is supported by a fully dynamic campaign system, creating a persistent combat environment with a high degree of unpredictability. The player does have an impact on his world over the course of the war and the success or failure of each mission is reflected in crew ratings and in the progress of the campaign.

Getting the iron on target and the crew home safely are the primary goals and in opposition is arrayed the might of the German Luftwaffe. Enemy fighters attempt to prevent your reaching the target, weather is a constant worry and flak batteries hurl death 30,000 feet upwards to try to halt your advance.

More than 200 targets are modelled in exact detail. Luftwaffe airbases and USAAF airbases, towns and cities are all located historically.

Installation and Setup

After installation (640MB) one runs the setup and makes choices regarding graphics resolution and colour depth,

Setting control options
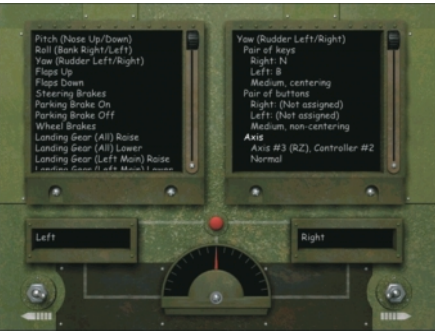
The Configuration Screen

sound API and language. We found that the skies look best under 32 bit colour. A PIII 600 with 256Mb RAM or better is required for high detail settings, but B17 will run on a PII 300 with 128Mb.

One must install A3D support in order to run the simulation, but do NOT tick the A3D option in the setup screen unless you have a sound board with the Aureal chipset.

The Options tab in the setup interface allows you to create a separate graphics cache for B17 to access. You will need another 350Mb of space beyond the 650Mb install size if you choose to create a cache. The minimum disk cache requirements are 400Mb, so you must have at least that much free space AFTER installing B17.

There are many choices to make as one enters the sim. Realism/Difficulty options offer fourteen different selections. We left the default selections for all options except Crew Autonomy and Navigation, and set enemy AI (artificial intelligence) to 'Veteran'. If you leave the default setting for Initiative you won't have to worry about commanding crewmen to put out fires or attend to the wounded.

The Graphics Menu offers eight selections. We chose 'detail' settings for everything except interior shadows and non-player B17s. The 'balanced' setting doesn't change the detail greatly and is best if you have a PIII 650 or less, or if you have less than 194MB of memory.

Next, we went to the Control Options Menu. You'll have to visit this menu to reassign any keystrokes as well as to configure your joystick. Set up each axis and the throttle separately by clicking on the left screen and then on the item at right.

B17 and the Bomber Crew

B17 is impressive in scope, offering up to 18 Fortresses in a flight and the ability to occupy any of the ten crew positions. Furthermore, you can fly as escort in the P38, P51 or P47, or for the opposition in the Fw190, Me109, and Me262. Stepping from a bomber position to a fighter position is possible whenever fighters are in the air.

Jan. 10, 1945. Our target was Bonn, Germany. The bomb run was routine with only moderate flak. Shortly after 'Bombs

Away' there was a loud crashing sound at the rear of the plane, and the nose shot up 45 degrees. My co-pilot, Dave Shroll, and I literally had to put our feet up on the control column to force the nose down and prevent stalling out. My navigator crawled back into the bomb bay to check the damage. Part of the tail section had been ripped off, losing our tail gunner, Marion Mooney.   Roy F. Statton, Pilot, 360th Bomb Group, USAAF

Crew management adds terrific immersion. While you can choose to set up the simulation so that the crew take care of themselves, that living and breathing (and sometimes dying) community on board the B17 will draw you in. You can issue orders, move the crew around, and generally listen and watch as they attempt to get their bombs on target in a hostile environment.

Crew management is via five mouse click interfaces, which allow you to change positions inside the Fortress, issue orders and move to an external view. A sixth interface allows you to move from bomber to various fighters once you are outside the Fort.

Crew management is critical. Wounded crewmen are not just a morale problem; losing a critical crewmember like the navigator or bombardier increases the likelihood of your mission failing. Likewise, a fire on board or jammed guns require someone to attend. (Again, depending on the crew initiative setting.) Crewmembers gain in skill as their missions add up, contributing to your success rate. Any time you take over for a crewman his learning rate increases, motivating you to attempt various positions.

The Campaign Modes

While B17 has training missions, quick missions and historical missions, the heart of the sim is the Bomber Commander or Squadron Commander mode. These roles allow you to command a single bomber or the entire squadron. The Squadron Commander mode allows you to choose the targets, plan the route, order recon flights and transfer crewmen around in accord with their abilities and your strategic priorities.

As Bomber or Squadron Commander you will care for your crew as well as issue

orders in the air. You may have to skip the primary target, choose a target of opportunity, or order your squadron lower to get below cloud cover. You can request weather updates via the radio. On the long flight to the target you can accelerate time up to eight times or use the TimeSkip feature.

On the Squadron Commander's desk are the Crew Information File, Bomber Information File and Medical File. Clicking on the folder opens the file and you can page through each report. A good commander is familiar with the crewmen and will monitor their morale and performance.

This B17 ditched and survived

An out of control Luftwaffe fighter collides with a Fortress

The jeep bonnet with files displayed

The bookcase in the corner brings up the Squadron History file. Clicking on the left correspondence trays brings up new mail, which carries details of promotions, decorations and the fate of every crewmember. Assessment of squadron performance and the progress of the war are also here and strategic priorities for the campaign are outlined in letters from HQ.

You click on the window to leave in your Jeep. There you find a clipboard with a list of your bombers and can proceed to the flight line. Panning around the bombers shows the combat scars. Resource tracking requires you to cannibalise seriously damaged aircraft for limited parts. Your driver will arrange the paperwork on the Jeep bonnet, including the Mechanical File, Crew Management File and Crew Replacement File. It is here that you enact crew transfers or assign crewmen to ground duty.

Systems and Flight Simulation

Damage modelling in B17 is dynamic. Wayward developed a unique twin-skinned model to allow them to create aircraft that look like the real thing when struck or punctured by shells. When flak or cannon score a hit, ragged holes appear through which you can see the landscape or clouds drifting by. Surfaces will turn black from smoke and fire.

Damage in an aircraft with a virtual crew is far more complex than merely the graphical modelling. The sounds of flak bursting, and the occasional THUMP of impact or cry from an injured crewman, raise the tension and the challenge. To which do you give your attention first? The engine fire in the waist, or the navigator who is screaming for help? What about that 109 coming in at your 12 o'clock?

Fighters also take damage and respond accordingly. P51s and Me109s can take

some damage, but a couple of hits on the Me262 are usually rewarded with a fireball. Damage models are closely connected to physics and flight models. In B17 you can ditch in water and survive, and you can always use your chute!

Aircraft panels are interactive, with most buttons and switch for pilots, navigator and bombardier performing their proper function. The manual references to features like cowl flaps, however, seem pointless. Engine temperature never changed in our Fort, regardless of throttle setting. Fuel consumption appears accurate and the B17 lacks an auto-pilot.

The Norden bombsight will cause history buffs to drool. The pilots have six unique panel views, breaking down significant systems into manageable chunks. The routine for takeoff is fairly complex, as is lining up the bomb run.

Interior damage shows the results of a Luftwaffe attack
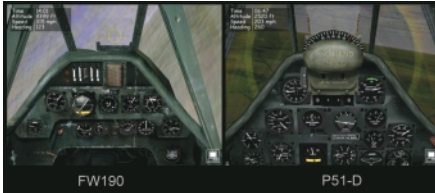
FW190 and P51-D Cockpits in B17

The map with targets selected, route and waypoints. The purple cameras show where recon information is available

Two Pilot Instrument Views

The manual doesn't skimp when it comes to systems, and training for each of the officer's positions is detailed.

The flight models are good but not precise. The actual service ceiling for the P51-D Mustang was 42,000 feet and Wayward nailed this one. The P51 stalled gently, dropping one wing and completing two rotations before we recovered. Spins are much easier than in European Air War. Blackouts and red-outs are modelled but onset is later than you might expect.

The aircraft in B17 have too much power, in particular the P51-D, which has a climb rate roughly that of the F86 Sabre jet. Wayward have noted the issue, and suggest that somewhere in the end stages of development one of the prop or aerodynamic models was incorrect. They are looking into the issue. For the moment, you can, given the right conditions, get the B17 to climb like a 737. However, the Fortress itself feels like a big bird, and you won't be pulling any tight turns. You can, however, do a loop or two when she is light at low altitude (again, the power problem). We were unable to complete a loop with a bomb load.

Artificial Intelligence and Gameplay

B17 has three components of interaction: friendly and enemy fighters, the crew on the Fortress you occupy and the other bombers in the squadron.

Enemy pilots vary in skill depending on your initial setup choices. If you choose Elite AI, you'll find that your gunners will score fewer kills and the skill of the enemy will vary more greatly in marksmanship and tactics.

We observed a range of approach tactics in the enemy AI. We've seen enemy fighters approach in a Rotte (a fighting unit of two aircraft), and in a line (as many as four passing through the formation and concentrating firepower on one or two bombers). We've also seen them roll away out of the formation and we've seen them pull high or break low. Me262s will always attack from the rear quarter.

About the only weakness in the enemy AI is with regard to dogfighting. They appear to generally ignore enemy fighters. But then, this is a B17 simulation after all!

On the other hand, climbing into an Fw190 and racing ahead of the formation and then making a slashing pass through it is quite a thrill. Our wishes were two: first, that rockets had been included for the German aircraft and second that a few simple wingman commands had been included to make it possible to actually lead a flight of enemy aircraft. Once you climb into the cockpit you are on your own.

Bomber crew AI is where the effort has been spent and it shows. The crew is fascinating to watch. Countless hours of motion capture in addition to painstaking

Bf109 diving away from attack on formation

Fortress at dawn

animation have been used to generate an intelligent and living bomber environment. You will see them stretch, scratch, assist a wounded comrade, walk around, peek out windows, shiver, and generally look human, tired, fearful and cold.

Both skill and morale are modelled for the crew. Skill grows with additional missions and with 'training', consisting of your occupying their positions and showing them what to do. Skill is also set for crewmen at the beginning of the campaign and it's wise to know who has which abilities when assigning a member to administer First Aid.

Morale is a factor of your leadership, mission success and loss of crewmen and aircraft. If you take care of your crew, their performance over successive missions will be increased.

Documentation

The manual makes some significant omissions. The Squadron Commander mode relies on your choices in target selection and if you don't choose high priority targets, your mission ratings suffer. But how do you know which targets have strategic priority? The manual doesn't say, but the information comes to you via the mail IN-BOX in the Squadron Commander's office.

Furthermore, when you first fire up the Squadron Commander campaign, the skill level of your officers in the lead

Pursuit Curve from a USAAF Manual

aircraft (the one you will fly) may be quite low. It is critical, however, that the lead aircraft have the best pilot, co-pilot, bombardier and navigator available. Letters from HQ will advise you to ensure that the best officers are serving on the lead Fortress.

How do you get the best officers out of another Fortress? You need to effect a transfer. The manual lacks instruction, but we discovered that this can be done from the documents presented to you on the hood of the jeep after you inspect the bombers.

The 145 page manual is otherwise adequate, though it could have been a bit more substantial.

On the other hand, the command card is a laminated poster size fold-out, one of the nicest we have seen at 14" by 18". On one side is the layout of the pilot's instrument panel, with a complete listing of command keys in the sim. On the opposite side are images of the cockpits for each of the six flyable fighters in the simulation, including side views.

Bugs and Issues

Most flyers will find B17 is trouble free and some reported issues are tied to incorrect drivers and lack of disk space. Some reviewers have complained of occasional crashes or lockups. We had only one lockup, but we have been unable to adjust the volume sliders to allow the crew voices to be heard when inside the Fortress, having to rely on the subtitles (Videologic Sonic Fury running under Windows ME, if anyone knows a fix!).

A Page from the B17 Manual
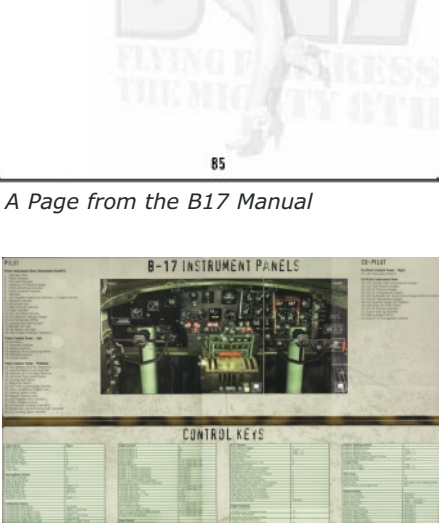
The Command Card

A few players have noticed occasional erratic behaviour by escort fighters. Many have spotted the missing texture for the gun-sight in the P38, an omission noted by Wayward. At the time when the gun-sight went missing, so did the white 'L' that should appear in the middle of the black triangles on the tail and wing. Taxiing B17s occasionally misbehave and crash into things.

Perhaps the single largest complaint is of stuttering and pauses, particularly in the gun positions. We suspect this relates to sound issues, and upgrading to DirectX 8 has solved the issues for some, while creating issues for others. Some pilots have landed with their crew intact only to discover that they are listed as killed.

We're told that a patch will be available by the time this issue goes to press. MeatWater, creator of the sound add-ons for European Air War, has indicated his desire to release an add-on. Wayward will also release a guide to tweaking key database files, which will allow manipulation of a host of sim components.

The Co-Pilot Moves toward the tail

SOME BACKGROUND ON THE REAL THING

360th Bomber Group, B17

The Flying Fortress was a powerful military machine, loved or feared depending on where one stood in the conflict. Ask the man in the street to name an important WWII airplane and he will generally come up with one of three: the Mustang, the Spitfire, or the Flying Fortress. How did it become so famous?

On 16th July 1935. Boeing Aircraft Company paraded its entry for the US Army's competition to supply the Air Corps with a new medium bomber. Times were tough, and Boeing desperately needed to win the competition. The Army Air Corps would evaluate the contenders on the basis of a circular proposal.

The proposal actually suggested a twin-engine design, but Boeing took a risk with a four motor aircraft. The prototype was hailed by Boeing's PR department as "the world's first four-engine all-metal monoplane bomber".

The design impressed the journalists and Richard L. Williams of the Seattle Daily Times captioned his photograph of the shining new airplane as the "15 ton Flying Fortress." The raised gun positions seemed to fit the description and Boeing quickly embraced the moniker for publicity purposes.

The design won the competition, and 14 aircraft were ordered. The first B-17B's entered service in 1939 and the following year, additional orders were placed for 250 aircraft. Later in the year additional orders were placed for B-17Cs. With improved engines and armament, the C's were the first of the classic Fortresses.

The Eighth Air Force's bombing campaign against Germany was opened by A-20s in July, 1942, under direction of the RAF. During the summer the first of the B-17 Groups arrived and the first scheduled missions were flown by the 97th BG's B17-Es on August 16th, the target being the rail yards at Rouen-Sotteville.

B17 the simulation begins in Europe in 1943. The Western Allies had agreed to take the war to the Germans first, with the Japanese taking second priority. While forces were being gathered for an invasion of the Continent, the USAAF joined the RAF in an air offensive against the enemy. The US element participating in the conflict initially was the 8th Air Force, based in England. The 8th carried out daring daylight missions on targets deep within Germany, without fighter support. The chief vehicle of those raids was the B17 Flying Fortress.

"The flak was unpleasant, although one always felt we were unlikely to get a direct hit. On the run into the target it became more accurate, mainly because we had to fly straight and level for a few minutes for the bombsight to settle down and the bombardier to ensure that the cross hairs were on the target when he released the bombs. With a hundred or so aircraft making virtually the same run, the anti-aircraft gunners had an opportunity to get some steady shooting in."

-John Curtiss, formerly with Nos. 578 and 158 Squadron, RAF

"Finally I succeed in getting one of the Fortresses flying on the outer flank. I observe the inside right engine hit. The Fortress simply closes in and slides over into the well protected centre of the formation. A frontal attack on the formation produced no result. I narrowly escape a collision with the huge tail unit of one of the Americans. The rudder alone is as big as the entire wingspan of my Me109." Heinz Knoke, from 'I Flew for the Fuehrer'

SUMMARY

B17 is a marvellous product, a landmark release and a true simulation of the Fortress, her crew, and the combat environment. It is accessible to the novice, a great deal of fun and highly immersive. If you have recent hardware you will be entranced with the graphics and effects. If air combat with a difference appeals to you, then we can highly recommend this simulation.

Leonard Hjalmarson

REVIEW SCORE:

Publisher: Hasbro Interactive	**Price:** £21.99
Developer: Wayward Design	**Release Date:** Out Now
Website: www.b17flyingfortress.com	

At a glance: With excellent sound, motion animation, outstanding graphics and support for hardware T&L, B17 looks good and flies even better. Simulating 14 different roles and with an interactive crew, there is something here for everyone. Demanding on hardware and lacks support for force feedback.

SYSTEM REQUIREMENTS: P II 300MHz, 128Mb RAM, 16Mb 3D graphics card joystick

RECOMMENDED: P II 600MHz, 256Mb RAM, 32Mb 3D graphics card

Ultimate Airlines

Flying here, there and absolutely everywhere

When flying heavy jets, it is very tempting to fly in a straight line from one airport to the next, possibly adding a few random beacons in between. There are two disadvantages to this technique. Firstly, it is not how most airliners are flown, as commercial jet flying involves following the airways. Secondly, even a 200 mile journey may get rather dull if your only challenge is the landing at the far end. You can fix this by proper flight planning before you set off. However you may like to have someone relieve you of this chore by planning your flights for you. Ultimate Airlines does this by providing over 250,000 flight plans ready for you to use on Flight Simulator 2000. The flights are based on those used by actual commercial operators and mimic the schedules they use. Hence it is your own back room flight planning team in a box.

The software installed without a hitch but there was a very

occasional run time error when selecting a non-existent airport. Otherwise, no obvious problems were found during our use. The package is relatively intuitive and we found that only a brief read of the manual is necessary. We should confess that for most of us (and probably many of you reading this) the general rule is "if all else fails, check the manual!"

Flights can be selected by setting the departure and destination airports individually. Alternatively, you can study

the departure and arrivals board at any airport and then select a flight that takes your fancy. The flights produced are easily integrated with Flight Simulator 2000 and can be exported to ProFlight 2000 too. You can record your Ultimate Airlines flights in a logbook at the press of a few buttons.

Ultimate Airlines claims to use the same departure and arrival times that are used by real world flights. We checked a few of the schedules at random and they do seem

to match the operator's reasonably well, allowing for the inevitable timetable changes. It also claims to use realistic flight plan routes. A few of these were checked, but we found some of these to be different to those used by the actual airlines. This is not really a problem, as different airlines use different routes anyway. Unless you are an absolute stickler for total accuracy, then a plausible route is as good as the real thing and should keep you happy.

So are the routes plausible? Looking in detail at the flight plans provided reveals some rather odd route selection. Every route from London Heathrow routed directly to the Ockham VOR before turning in the general direction of the destination. If you are heading south, this is not really a problem. However, if you are simulating a shuttle flight from Heathrow to Manchester, your route starts off heading south 10.4 miles to Ockham, and then turns back on itself to head north to HEMEL. All is not lost however, as the package enables you to remove Ockham and have a flight that is a reasonably efficient use of the airways.

A number of airways are unidirectional in the real world, for example UB321 and UA1 can only be flown southwards between Manchester and PEPIS. Unfortunately, if you simulate BA7735 from Southampton to Manchester, the plan uses these airways in a northerly direction. There are several instances of this disregard for unidirectional airways, which suggests that the algorithm used to select the routes does not consider this aspect of airways flying. Again, whether this is relevant to you will depend on the strength of your quest for absolute realism. If you just want to have fun flying between airports using reasonably complex routes through the airways, then Ultimate Airways works well.

The generated flight plans run directly to and from the airports. The Standard Instrument Departures (SIDs) and Standard Terminal Arrivals (STARs) are not included in the Ultimate Airlines flight plans. Flight plans are not required to include SIDs and STARs, so this is realistic, but it does mean that you will have to find your own way to your chosen instrument approach path at your destination.

The flight plans produced are in a similar format to those used in Flight Simulator 2000. This means that the heading written on the same line as a waypoint is the heading used to take you to it. This is probably to allow easy integration with Flight Simulator 2000, but it can be a little confusing. It is more common and generally easier for the heading written adjacent to a waypoint to be the heading you turn on to when you get there, but you can easily adjust to either system.

Whether Ultimate Airlines will suit you depends very much on your expectations.
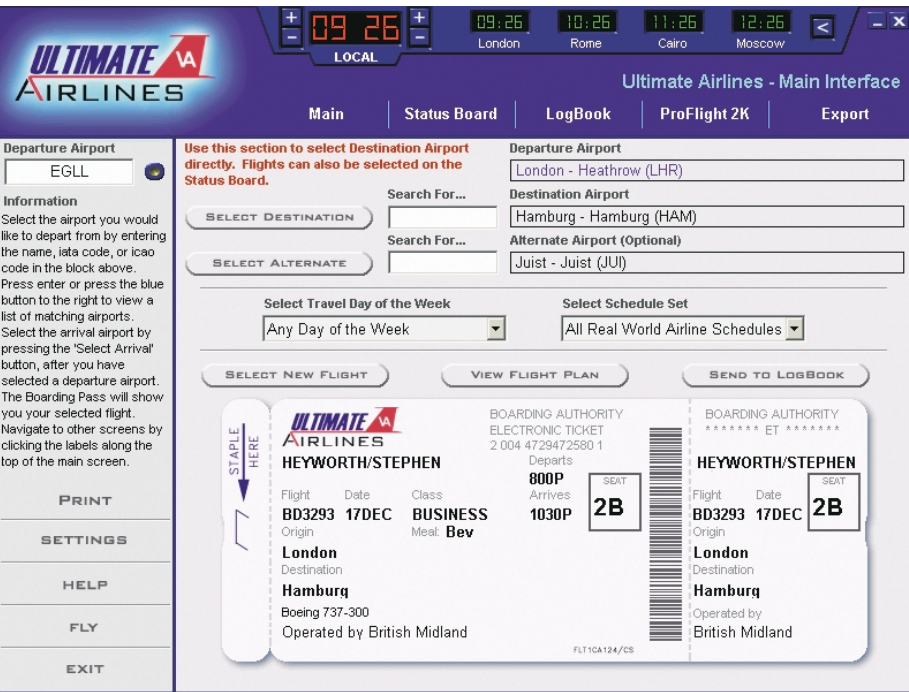
The main page showing a British Midland flight to Hamburg
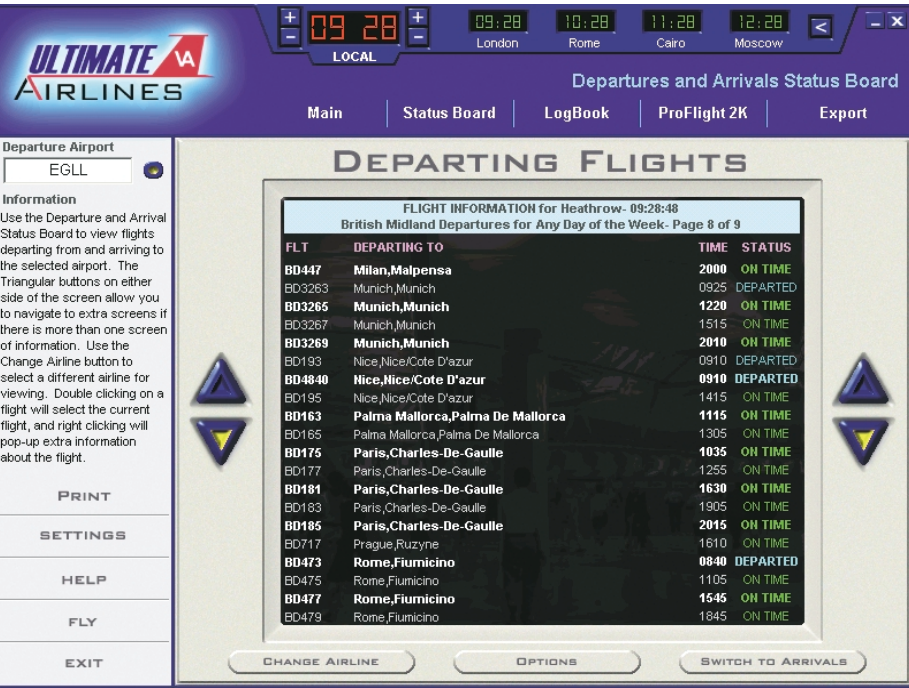
You can pick any flight from the Status Board

If you want your airways flying to be totally accurate, you may only benefit from the highly extensive schedule of flights. On the other hand, if you don't know how to plan for the airways, or if the minor flaws in the flight planning are irrelevant to you and you simply want a huge number of interesting flight plans for your heavy metal flying, Ultimate Airlines is excellent. You can fly pretty much any scheduled route you wish. There are short hops such as from the Faroe Islands to Reykjavik. There are long haul flights from Ho Chi Minh City to Dubai International. There are even the supersonic transatlantic

flights from Heathrow to New York JFK, via Ockham, of course! ■

Stephen Heyworth

Heathrow to Manchester via Ockham

Transatlantic flights are planned too

REVIEW SCORE: 🦢🦢🦢🦢🦢

Publisher:	JustFlight	**Price:**	£24.99
Developer:	Flight1 Software	**Release Date:**	Out Now
Website:	www.flight1.com and www.justflight.com		

At a glance: A comprehensive worldwide list of scheduled flights, which are used to create flight plans for FS2000. The routes are reasonable but there are some serious inaccuracies for the purist aviator. However, Flight One are to be congratulated on a bold idea that is bound to improve with time.

SYSTEM REQUIREMENTS: PII 266, 32Mb RAM
RECOMMENDED: PIII 400, 64Mb RAM, 3D graphics card

BATTLE OF BRITAIN

Tally Ho!
Bandits at angels
one-five...

Stuka!

Can you keep the White Cliffs safe?

The Bf109 - bane of Fighter Command

The history books on World War II would be a lot shorter if it wasn't for the incredible bravery and skill of everyone in RAF Fighter Command. In 1940 Hitler managed to sweep through France in just six weeks and was all set to cross the Channel to execute Operation Sea Lion - the seaborne invasion of Britain. Air supremacy was the only prerequisite that the Fuhrer demanded, but it was to be denied by the RAF.

Empire Interactive has ambitiously attempted to recreate the Battle of Britain on the PC in every detail. At its core, this is a flight simulator that aims to bring a new level of realism to the WWII fighter genre. Wrapped around this is a dynamic campaign engine that is a fully-fledged wargame depicting the events between July and September 1940. Based on the successful MiG Alley format, the player can jump into any aircraft through the battle and bag a few enemy before returning to the War Room to direct proceedings.

in the upper-right corner of the screen to help, but things can still be utterly confusing in the midst of battle. As with other sims the padlock view takes time to master, but becomes essential to being an effective combat pilot. The implementation here is especially good. The aircraft responds to forces such as aerodynamic buffet, with the cockpit shaking, along with the stick if it has Force Feedback. This combination of visual and sensory feedback allows you to fly the plane right at the limit. Holding it on the edge of the stall while trying to out-turn your foe has never been so absorbing.

First and foremost, Battle of Britain is a flight sim and manages to deliver on its promises.

Graphically the aircraft are not up to the exquisite detail of Microsoft Combat Flight Simulator II, nor is the terrain quite as sumptuous as B17 Flying Fortress II, but it isn't far off. The terrain is the usual satellite photo bit-mapped quilt, with added 3D trees and buildings, that looks great at altitude. Low down it becomes murkier, although there are some neat touches such as farmyard animals roaming the landscape (Baaahh!).

Externally the planes have that 'clean' look, reminiscent of the original Microsoft Combat Flight Simulator. While they lack the utter photo-realism of Combat Flight Simulator II, they are geometrically spot on and have authentic markings too. Internally the cockpit is both virtual and interactive. Forget the 2D panels of old, here every dial and switch has been reproduced in full 3D. With the graphic settings turned up the glass canopy has all of the muck and grime that is inevitable on a battle-worn steed. Rather than being a drawback, these subtle visual cues help enormously in staying oriented while using the padlock view. Without such cues (i.e. on lower detail levels) it can become impossible to tell which way is up, inevitably leading to a spin, stall, or premature liaison with the ground. There is a useful artificial horizon

This is where Battle of Britain sets itself apart with a hairy, seat-of-the-pants experience miles ahead of the competition. Just as during the real Battle of Britain, aces aren't two a penny. Here it takes plenty of skill and patience to bag even a single enemy fighter. For novices, turning down the flight model realism and enemy skill level is a must or else you won't stand a chance. The AI (artificial intelligence) is devastatingly good and the aircraft feel so lively under the stick that it can be frustrating at first. Keeping the target in your crosshairs is far harder than in most other sims, but then being Top Gun takes plenty of practice. While it isn't easy, keep persevering as bagging your first kill is that much more rewarding. To savour those sweet moments there is a replay camera that can be slaved to the trigger button. Simply firing will then record up to ten seconds of action. For a single mission these pieces of footage are spliced together and saved to file, so you can boast to your friends and show them proof of your claims.

The 142-page manual has tips for flying all five of the included aircraft: the Spitfire, Hurricane, Bf109, Bf110 and Ju87. Each plane has its own distinctive characteristics, such as the high climb rate of the 109 and the superior turn radius of the Spitfire. The British Merlin engines were not fuel injected and indeed, if you pull negative Gs don't be surprised to hear the engine cough as the gravity-fed carburettor shows its limitations. With full realism set you can manually set the propeller pitch, but not before you've run through the correct engine startup checklists, priming the

The mighty Spitfire, hard to tame but a pedigree dogfighter

Alt 13394ft   Hdg 202   Speed 222Kts   Thrust 90   Gun Ammo. 1175

COMMAND & CONQUER

While the pilots in the air were the stars of the Battle of Britain, the controllers on the ground had to make sure that the aces were in the right place at the right time. And this sim not only lets you fly the planes, but includes a fully-fledged wargame that puts you in command of either the RAF or Luftwaffe. The campaign can be started from one of four points from July to September 1940, or just start at the beginning and work all the way through to the bitter end:

- Convoy, the Battle begins as the Luftwaffe draws the RAF over the Channel by targeting ships

- Eagle Attack, radar stations and forward airfields become targets through August

- Critical Period, the heat is turned up as inland airfields and factories are hit

- Blitz, the war of attrition is too slow so the Germans go all out to flatten London. September 15th is the day that saw off Hitler and his aerial army in a huge melee over the capital.

The campaign can be played at the level you prefer, depending if you'd rather be up in the air than stuck in a command bunker. At its most basic you can let the computer make all of the decisions and simply pick which missions to fly. The battle unfolds in real-time as bombers come in from the continent and fighters are scrambled to meet them. Clicking on a unit icon brings up the details, and clicking again lets you hop straight into the cockpit of any aircraft in the formation. Dialogue boxes pop up to tell you what's going on, and the frequency and level of detail can be tuned to your liking.

Keeping track of the incoming raids is crucial to your success. The Dad's Army style big arrows show you last known direction, and you have to be especially careful when formations split to attack several different targets. As you become more proficient in managing the campaign you can drill-down and manually assign targets, move aircraft between airbases, set squadron readiness levels and scramble the fighters. The campaign screen and dialogue boxes are all well laid-out, and provide a huge amount of information in an easy-to-use way. With over 600 RAF aircraft under your command, or 2000 on the German side, this is as full-scale a wargame as any around. Empire has done well to give it enough depth and variation to make it highly playable in its own right. When combined with the excellent flight simulation, the overall package is a fantastically absorbing one.

Call the shots using the Campaign Directives menu

Drill down or delegate, the choice is yours

Keep tabs on your assets on the Tote board

Heads up, they're coming in over the coast

Fingers crossed that Mother Nature is on your side

There goes another one

The view from a 109

Teamwork could save your bacon

Can you remember which way is up?

The cockpits are all virtual

Come on, come on…

engine with fuel and hitting the starter to tease the engine into life. The Stuka bomber is notable for being modelled in detail, replete with dive brakes, warning horns and its unmistakable whistle of death. Ground attack missions can also be flown in the more conventional Bf110, in which you can also hop into the gunner's seat, although this is no easy station to master.

For the impatient QuickCombat missions provide instant gratification, from basic aircraft handling, to the Blitz on London. You can climb into either British and German planes as section leader or mere wingman. The Historical single missions provide spectacular pitched aerial battles of truly epic proportions. Waves of bombers with dozens of escorts filling the skies is an awesome sight, but a daunting

one for a humble Spitfire or Hurricane pilot. The cry to "get stuck in" over the ether is all that's needed to galvanise your resolve and rip right into the heart of the Luftwaffe formations. With so many aircraft around it's all too easy to bash into both friend and foe, so turning off collision damage is well advised - if not entirely realistic. To help with your peripheral vision, RAF and Luftwaffe icons

CARD TRICKS

To obtain maximum graphics performance, flight sim developers do wonders to push the boundaries of what is physically possible in silicon. The downside is that problems inevitably crop up when new hardware and software (e.g. DirectX) emerges just before a games release. While beta testers pick up on some incompatability problems, it is not until the software is released into the 'wild' that many glitches show up. Battle of Britain is no exception, and users may find themselves frustrated at not being able to play the game out of the box. In anticipation of graphics card problems, Empire has included a configurable graphics card database file (cardbase.rc) that can be modified until a working setup is achieved. Bravo, if only all developers were this forward-thinking and flexible in their products. So here's what you have to do...

Settings for most common cards are included at the bottom of the file. By tinkering we easily setup a Creative Labs GeForce MX card to work by simply adding the following line:

GeForce_MX 0110 NO_TEXTURE_TARGET
LOCK_TARG_FMT_TO_BACK_BUFF

We also managed to coax Battle of Britain into life on a Pentium III 550MHz laptop with an onboard 8MB ATI Rage Lite graphics card. It's not particularly fast with the details turned up, but with the auto-frame rate option turned on it was eminently playable.

If Battle of Britain doesn't work first time, then read the instructions contained within the cardbase.rc file and persevere, as you will almost certainly be able to find the right combination, and the effort is very worthwhile. One last thing - Make sure you turn off the clouds and radio chatter on the PC Settings screen to improve the frame rate considerably.

HERE COMES THE SCIENCE

1. Open the file cardbase.rc (in your BoB directory) in Notepad

2. On line number 85 delete the leading '#' in front of DEFAULT (use the Find command, CTRL-F, and enter #DEFAULT in the box)

3. Save the file (CTRL-S) and exit Notepad

4. Now load up Battle of Britain

5. Enter a QuickShots mission, any will do

6. When the 'White Cliffs of Dover' loading screen appears, note down the graphics card name and code number that appears in the top left-hand corner

7. Exit Battle of Britain

8. Reopen cardbase.rc in Notepad

9. On line number 85 replace the leading # in front of DEFAULT (so the line now reads #DEFAULT)

10. At line 134, at the end of the list of graphics cards, add, on a single line separated by spaces:

Card_description_without_spaces Code number for card NO_DEVICE_VALIDATION

11. Reload Battle of Britain and try another QuickShot mission

12. If that does not work then read the comments in the cardbase.rc file, describing each setting. Then try them out one-by-one (steps 8-10) until you find a workable solution

Doing the Twist

One 'confimed' I think, old boy!

Alt 17147f1   Hdg 65   Speed 99Kts   Thrust 75   Gun Ammo. 2124
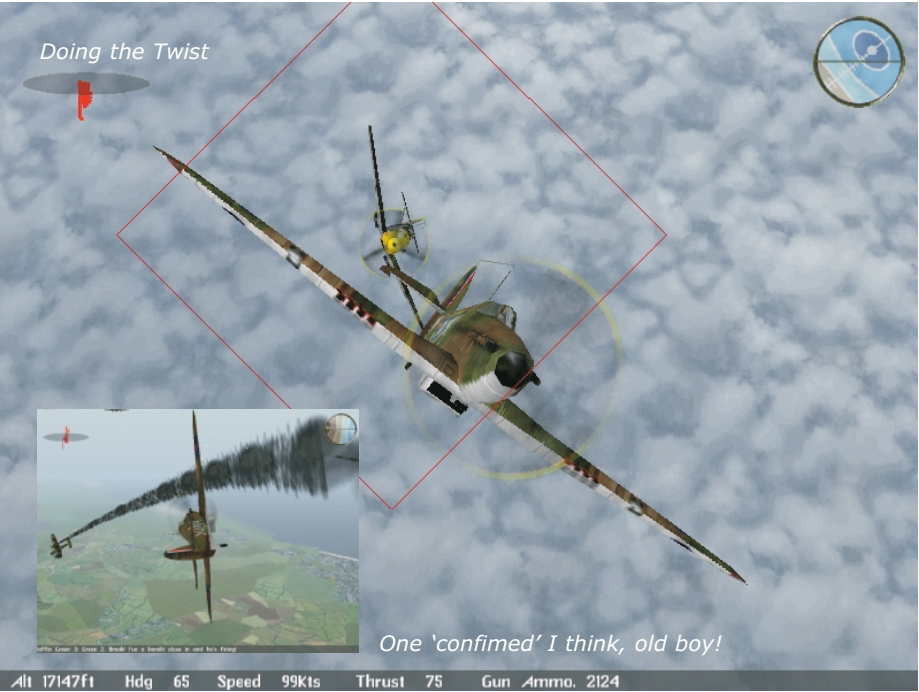
dance around the edge of the screen to indicate where other planes are. This is only marginally useful. Far better is the Elite-style radar display in the top left corner that shows relative aircraft position and height in an intuitive way.

Not that it's difficult to find a target when the sky is so busy. The feeling of utter mayhem is exacerbated by the excellent sound of aircraft screaming past you. The radio chatter is in both English and German and seems authentic and adrenalin-inducing at first. After a while it can become droll though and turning it off can improve the frame rate significantly. This is especially crucial during large dogfights, as the CPU can occasionally struggle to keep up when things get really busy.

Battle of Britain can be tuned to run well on most PCs with a bit of fiddling. You can either set the graphical detail levels one-by-one, or let the computer tune them for you. Setting a minimum frame rate works well, and can act as a good starting point for gradually including more detail. On our review PC - a 450MHz Celeron with 128Mb RAM, Creative Labs 32Mb DDR GeForce MX graphics and Sound Blaster 1024! sound card - we could run happily at 800x600 resolution and 32-bit colour depth. Unfortunately we had problems with full screen anti aliasing (FSAA), which isn't directly supported within the game. However, it still looked good and ran smoothly (15-20 frames per second) with most of the detail levels turned up, clouds turned off and literally dozens of other aircraft buzzing around.

Up in the air Battle of Britain certainly holds its own, but where it really stands out is on the strategic side. As described in our Command and Conquer section, you can take control of either the RAF or Luftwaffe to steer the course of history as

The clouds are gorgeous, but slow CPU

Landscapes that Turner would love

you see fit. The outcome of the Second World War hung in the balance during the Summer of 1940, and Rowan's excellent dynamic campaign engine is ideal for playing out 'What If?' scenarios. Reichsmarschall Goering had it wrong, but how wrong? And maybe Fighter Command could have staved off the Luftwaffe in shorter order. Using judicious time acceleration, the pace of the game is always exciting and can turn suddenly if you let your guard down.

This combination of wargame and simulation is unique in that its execution is excellent on both fronts. At its most basic, dogfighting and ground attack missions are

MULTIPLAYER MAYHEM

To recreate the camaraderie of the Battle of Britain there are plenty of multiplayer options to choose from. Up to eight aviators can play over the Internet or local network, or you can link up to a mate directly via modem or serial cable. Rowan has thoughtfully included full co-operative capability, so you can fly fifteen of the QuickShot missions with your buddies covering your tail. Unfortunately the Dynamic Campaign is not available in this mode, although it would make a superb persistent online environment. What a pity!

Deathmatch dogfights are well catered for, with several starting scenario such as all heading inwards or outwards, or circling. Similarly, in Team Play you can set a host of starting formations. With such good flight modelling Battle of Britain is set to become a real online star, expecially for those wanting the realism of Warbirds and Aces High but without the monthly subscription fee.

The force is strong in this one

gripping due to the impressive flight modelling, enemy AI and breathtaking aerial melees. When combined with the intricate real-time strategy campaign the possibilities are literally endless. The game is not as user-friendly, easy to play or as expandable as Microsoft's Combat Flight Simulator II, but for those who want something with more depth and challenge, Battle of Britain fits the bill admirably. ■

Kenji Takeda

REVIEW SCORE:

Publisher:	Empire Interactive	Price:	£24.99
Developer:	Rowan Software	Release Date:	Out Now
Website:	www.empireinteractive.com		

At a glance: What hardcore dogfighters have been waiting for. Superb flight modelling with the best dynamic campaign ever. Beginners may find it an uphill struggle, but perseverance is well rewarded. Great Force Feedback too.

SYSTEM REQUIREMENTS: PII 233, 32Mb RAM, 8Mb 3D graphics card
RECOMMENDED: PII 450, 128Mb RAM, 16Mb 3D graphics card

Corporate Pilot

Flying under a corporate banner

Corporate Pilot is the latest offering from Abacus that follows in the footsteps of their Private Pilot package, only this time depicting aircraft very much at the top of the executive tree. It contains luxury models from Beechcraft, Cessna, Dassault, Raytheon and Rockwell that most of us will never set foot in, let alone fly. However, with the assistance of Flight Simulator and a PC capable of some fancy 3D contortions, you can sit behind the controls of these marques in the comfort of your own home.

You may have noticed that the release of Abacus's FS Design Studio has instigated a flurry of new aircraft and scenery designs from hundreds of designers all over the world. Most of these offerings are detailed and professional in presentation, which is a testament to the dedication of the designers and the undeniable excellence of FS Design Studio. This release serves to underline the model quality that can be achieved, because most of them were created by Terry Hill with the help of FS Design Studio.

The Corporate Pilot package includes three jet aircraft and three turbo props. They all qualify for the corporate title, with pressurised cabins and a comfort level not found on any commercial aircraft. Starting with the innovative Beechcraft Starship 1, with its distinctive shape, swept back wings and propellers mounted at the rear. The airframe is modelled to a standard that draws on all the advanced features

A close-up of the Flight Management Computer

we've come to expect from Flight Simulator 2000 compatible products. Complete with a well-designed panel that for the most part is fully operational, given the normal constraints of the host program. It doesn't reach the photorealistic standard of the PSS products also reviewed this month, but it all works well enough.

In order to make the panels easier to use, Abacus have introduced a new method of launching the various parts of the instrumentation that would normally be seen inside the cockpit. You simply right click the mouse over the indicated point and the relevant section appears, then a second click closes it again. This method is used for opening the FMC (where available), autopilot, throttle quadrant, engine instruments and radio console. However, in some aircraft these are combined into a single panel.

The other two propeller aircraft, the Rockwell Twin Commander and the Cessna 441 Conquest are much more conventional in design, as is their cockpit instrumentation. Both carry more in terms of analogue instruments, although the Conquest has a CRT based artificial horizon.

Moving to the jets, we come to one of the most prestigious aircraft in the sky, the beautiful Cessna Citation X. This is one of those aircraft that you'd sell your soul

CORPORATE CRAFT

Raytheon BeechJet

Cessna Citation X

Cessna Conquest 441

Dassault Falconjet 2000

Rockwell Commander

Beechcraft Starship

Is that Arnie Lee in the back seat?

The Falcon cockpit with all the panels

THE VARIOUS COCKPIT LAYOUTS

The Beechcraft Starship – not dissimilar to the Enterprise

Bilionaires favourite – the Cessna Citation

The detail in this Conquest panel is excellent

The splendid BeechJet panel while cruising gracefully

What you see when you command the Commander

The Falconjet 2000 panel – shall I wrap it for you, sir?

for and Terry Hill has captured the essence of this particular plane. From its curvaceous lines and the massive Allison turbofans that will cruise all day at 0.91 mach, to the fully operational glass cockpit. It really is a pleasure to fly. The next aircraft, the Dassault Falconjet 2000, is no slouch either, with a cruising speed of 0.80 mach. It may not be as pretty as the Citation, but we'd be happy to have one as the PC Pilot run-around. Then last, but by no means least, there's the Raytheon BeechJet 400A. This is the smallest of the three but depicted with the same care and attention to detail.

Obviously the most important feature of any aircraft collection is how well they perform in relation to their real world counterparts. Unfortunately an exact comparison is somewhat speculative, because none of us have actually flown these millionaire's toys (or not regularly,

anyway). However, after some diligent research into descriptions by the lucky few who have, we could go some way to evaluate the performance of the Abacus versions, which over the review period were stable and in some respects 'very comfortable' to fly. Although the models are quite detailed, there was surprisingly very little frame drop from the standard aircraft.

In addition, the package includes a full set of checklists for each aircraft and a fully illustrated manual that incorporates the pilot flight school. You also get detailed spec sheets for each aircraft and a set of seven round robin adventures that will take many weeks to complete. These include fully detailed flight plans, copies of the sectional map segments, any relevant approach plates and airport schematics needed en route.

Although Abacus have already released a patch to address a few of the original anomalies in Corporate Pilot, there are still one or two lurking about that need some work. For example, the moving map display in the BeechJet cockpit doesn't fit inside the instrument housing, the same applies to the Citation X and the Falcon 2000. It appears to be a scaling problem that strangely only affects this instrument. We tried a number of different resolutions, which changed the shape of the display but didn't manage to fix it. Having said that, this is a fairly minor flaw and one that doesn't really make any difference to the pleasure you can have flying these aircraft.

Overall this is a good solid collection of Aircraft that are far better than those provided with Flight Simulator. If you fancy yourself as an executive charter pilot then you'll enjoy the challenges provided by Corporate Pilot. ■

Joe Lavery

This close-up clearly shows the high level of detail, including the passengers

Rear detail of the Falcon 2000 - she looks gorgeous!

REVIEW SCORE:		
Publisher:	Abacus	Price: £29.99
Developer:	Abacus	Release Date: Out Now
Website:	www.abacuspub.com	

At a glance: A neat way to take to the skies in style, without all the bother of winning the lottery. A few minor bugs mar the overall perfection

SYSTEM REQUIREMENTS: PII 300, 128Mb RAM, 3D graphics card
RECOMMENDED: PIII 800+, 133 MHz Bus, 256Mb RAM, 32Mb 3D graphics card

PC PILOT CLASSIC — CLASSIC FLIGHT SIMULATION PRODUCT

A close-up of the Qantas paint job

747-400 Pro

A new bird from Phoenix takes to the sky

This is the new approach view option

Set your start-up mode from this menu

The Lufthansa 747 makes a dusk touchdown

A CLOSE UP OF SOME OF THE DETAIL

One of four detailed engines

This is full flap on the Jumbo

"Detailed" takes on a new meaning

All parts of the flaps are included

You can smell the burning rubber

A few months ago we had the pleasure of reviewing one the finest single jet aircraft add-ons for Flight Simulator, in the form of a Boeing 777 from Phoenix Simulation Software. If you read the review, or subsequently bought the published version from Just Flight, you'll already know that the aircraft and its panel set a few new standards in terms of its design quality and overall function. A benchmark that we naturally thought would stand for some time to come. However, PSS have stretched those boundaries a bit wider, with possibly the most popular aircraft found in the Flight Simulator world, the Boeing 747-400.

You're probably aware that there have been many attempts at modelling the 747, some better than others but none of them come anywhere near this latest offering. The design of the aircraft in terms of its 3D model and various liveries is far superior to anything we've seen before. The externals are truly photorealistic and the panels are simply superb. But, let's try and keep our powder dry and have a look at this beautiful aeroplane first…

If you wander around the outside of a 747 you always question how such a large lump of metal actually manages to stay in the air and the PSS aircraft gave us much the same experience. Select an external view and scroll around the outside. If your machine is up to the task you'll notice details that other models don't have and although most of the time you'll be flying from inside the cockpit, we guarantee you'll spend more time admiring the outside that you ever have before. For example, the landing gear is modelled with complex struts and hydraulic pipes and it has tilting bogies that retract in the proper sequence. Similarly, the flaps and spoilers are made of separate sections that rotate and deploy correctly. The engines have animated fan blades and realistic reverse thrust deployment… we could go on.

Phoenix offers the 747 in several different liveries, including British Airways, Cathay Pacific, Lufthansa, Korean Air, Northwest and the rather colourful Qantas variant. They are all designed with the same attention to detail and include night textures that show illuminated windows, tail logos and landing light beams that spill over the fuselages. When they're captured in the right surroundings they can look remarkably real. Just have a look at the screen shots!

If you're used to the rather mundane default internal views, then you're in for a treat. The 747's flight deck is probably even more impressive that the outside, starting with the three large MFDs (multi function displays) duplicated here with all their primary functions, although we understand that in the real aircraft they are fully interchangeable, so any screen can display any data set. In the PSS version the left-hand unit is designated as the PFD (primary flight display), mainly showing the familiar artificial horizon and speed data. The centre unit contains the ND (navigation display), displaying course and map data and the right MFD provides Upper EICAS (engine information and crew alerting system) information. At the top of the main panel is the EFIS (electronic flight information system) and the MCP (mode control panel), which are integral parts of the autopilot.

A separate overhead panel houses most of the switched functions, including the electrical, environmental, fire prevention, engine start and fuel flow controls. There are other ancillary functions displayed but not all of them are implemented in the Flight Simulator environment. The same applies to the popup throttle quadrant, which mainly covers the flaps, throttles, trim controls and fuel cut off valves. This panel also contains the lower EICAS panel and one of the most complex instruments to master, the FMC (flight management computer).
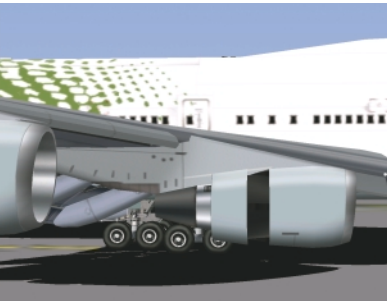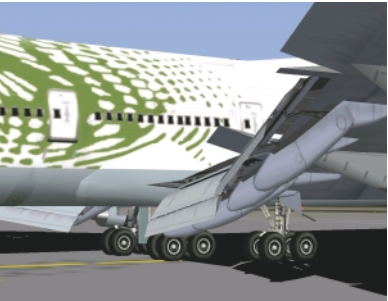
THE AVAILABLE AIRCRAFT

British Airways

Cathay Pacific
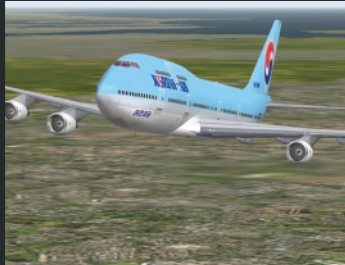
Korean Air

Lufthansa

Northwest Airlines

Qantas

South African

Close-up on the Cathay Pacific

The FMC is responsible for calculating the aircraft's current position using information it receives from external navigation sources. This data is then used to pass commands to the autopilot allowing it to track the programmed course. Unlike the 777 FMC, the instrument depicted in the 747 is almost a complete replica of the original. However, before we get inundated with letters reminding us about some of the more obscure functions that are not implemented, we are talking about the primary functions needed for accurate navigation.

Other goodies include a new approach and takeoff view that gives better visibility for these critical stages of flight and a new start-up menu that determines in what condition the aircraft will be when loaded. This refers to the engine and system status, which can be anything from all off, to ready to go. As before the (download) package comes with an excellent set of full colour manuals in PDF format.

To sum up, the PSS 747 is probably a close as you're going to get to flying a Jumbo

without stepping into a real 747. It behaves as expected, is quite forgiving for such a large aircraft and offers a genuine simulation for prospective pilots. The only adverse comment we could make is regarding the hardware needed to get the best from the 747 and a 3D card is certainly not optional. Of course, those of us involved in the world of flight simulations are well acquainted with the hardware requirements of our passion.

There are probably simulators around that cover the 747 to even greater depths but none that look so good, particularly within the Flight Simulator environment, especially at this price.

However, it soon mounts up if you want to download all the individual liveries (at £5 each) and we've heard from Just Flight that they are planning to release a full boxed version of this excellent 747-400 with 12 liveries and a video for £35. It sounds like it will be worth waiting for! ■

Joe Lavery

Our BA 747 climbs out north of Seattle

INSIDE THE COCKPIT

The overhead panel – swamped with switches
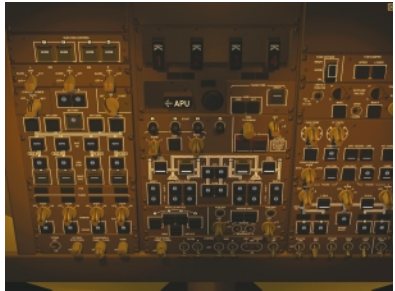
The overhead at night – don't think about the electric bill!

"Detailed" doesn't do justice to this panel

The panel lighting effects at dusk

Push this forward and feel the power!

IBIZA 2001

Flying to Balearic bliss

This scenery add-on for Flight Simulator 2000 from Sim-Wings covers the whole of Ibiza, which is the third largest Balearic Island. Ibiza is about 25 miles long and 13 miles wide, so it is roughly the same size as Greater London. Installing the software was reasonably straightforward, however, the description of how to 'register' (activate) the software is given in a readme.txt file. This simply stated the order in which to add the scenery and referred the reader to the Flight Simulator 2000 manual or help files. Either the instructions should have been more thorough, or the installation should have been fully automatic.

There are two scenery files that both have to be added to your Flight Simulator 2000 system. The first is the terrain, which completely remodels the islands of Ibiza and the much smaller island of Formentera. The ruggedness of Ibiza is increased significantly and there is some extra geographical detail near to the airport. There are what appear to be solar salt lagoons south of the airfield and the the significant rock of Isla Vedra is not far away. Unfortunately, if you fly too close to the Isla Vedra, you will unexpectedly have a building crash; the space occupied by the island for crash purposes is different to the actual pyramidal shape. Once you fly further than a few miles from the airport, the island becomes bumpy and green rather than undulating and green. There is still not a lot to see when you explore.

The second scenery file is the airport, which is represented in good detail. The terminal buildings are far superior to the small collection of boxes in the standard Flight Simulator 2000 scenery. They include the normal terminal amenities, a fuel tank farm, radar mast and covered car park area. There are several airliners

parked on the apron, a collection of light aircraft on the general aviation apron and many service vehicles dotted around the place. All of them appear to be static models as no movement was seen during the review. There are yellow lines and the occasional direction board to guide you between the apron and the runway. The area adjacent to the airport is also speckled with detail including some buildings, trees and windmills.

Taking off for a short flight to check the approach and frame rates, the runway felt unusually bumpy in a light aircraft. First the frame rates were checked. With the scenery complexity and dynamic scenery both set to 'very dense' and in good visibility, frame rates are about half of those you would find at Chicago Meigs. On the fast review computer (933 MHz and GeForce 2) the frame rate dropped to 13 frames per second. Sim-Wings do include instructions about renaming some files to remove elements of the scenery and thereby improve the simulation rate. This gives some options for those with slower machines. The ILS was found to be accurate, so a night approach was selected. The airport lighting is as good as it should be although the area floodlights cast odd-looking conical beams downward.

Overall the software seems rather expensive for a single airport. For comparison, the German Airports packages recently reviewed have eight airports, dynamic scenery and less of a performance hit; all for only twice the

cost. Unless you particularly want to have Ibiza in your virtual world, or are attracted to the more hilly terrain on the island, there would appear to be better value options available. ■

Stephen Heyworth

Ibiza airport with Ibiza 2001 is a very exciting place

Without Ibiza 2001 it's rather dull

Taxiing through the static scenery

Fly between the twin peaks of Isla Vedra and you will crash
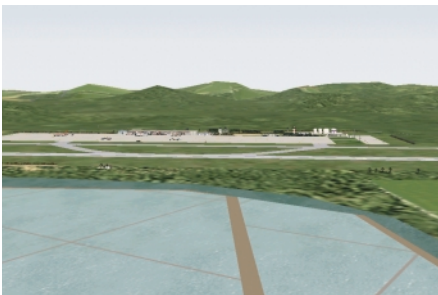
There are decent hills on the island and lagoons by the airport

Gatwick stand 33-the two vans in sight are both moving

UK 2000 1,2 & 3

Real UK airfields at last!

We have waited a long time in the UK to see the smaller airfields for Flight Simulator 98 and 2000 that we can recognise as truly our own, both from the air and the ground. Now, at last, it seems we have them. Gary Summons, the developer of UK2000 is to be congratulated, both on his research and his programming skills. For those who think that Chicago Meigs field is detailed, just wait until you have seen this edition of London Gatwick. Not only did we get lost taxiing around the complexities of the airport, but also we

were also able to follow moving buses, luggage carriers, whilst being dazzled by the floodlights and restaurant windows at night.

For those of you who like to practice flying circuits around your local airfield or club, these will amaze you. However, Gary has not yet completed the whole country, but the south west and south east of England are available, as well as the Channel Islands. You'll see the airfields from the circuits very much as they are in real life and you can even find

where you usually park your car or have your lunch. What is more, the windsocks will be waggling and Mike, the aircraft handler, will signal you into your aircraft space too. The dynamic objects are lovely little surprises. At one under-used airfield in Cornwall (we won't give the game away) you have to fly low over the main runway to clear sheep off before you can land, just like the real place apparently. This is what we mean by research. Personal visits and the close study of aerial photographs are what make these scenes so authentic. Radar aerials revolve and vans drive past you as you find your way to the tower.

So, we hear you ask, can I buy them in my local shop or order them by mail order? Unfortunately not the former, as they are currently only available as shareware (a publisher may be announced soon) but we included them on the CD with Issue 8 and again on this CD so you can have a try. For anyone new to shareware, the principle is that you try out either a demo or limited version of the software and if you like it, you can register and pay at the suppliers website and then get the full version or a code to enable the one you've got. In this case, the airfields are supplied as demos that work properly, but each runway has a huge brick wall across it, which you have to grit your teeth and fly through until you register. On registering, you will be sent a small file that releases the whole unblemished scenery to you. We forgot to include the details of where to register in the last
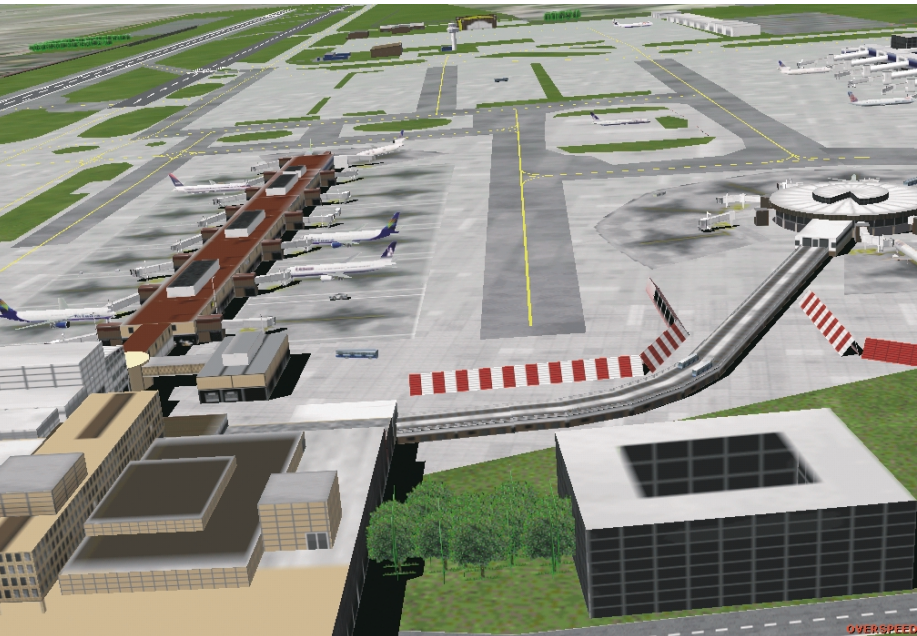
The complexities of Gatwick need to be experienced rather than just seen

Old Sarum Flying Club as real as it gets!

Look carefully before landing here!

Manston terminal building at night

Get those sheep off the runway!

Taxiing into Manston in Kent

issue (apologies to everyone who had to ask), but if you take your choice and want to pay your money, you'll need to visit www.fltman.freeuk.com/public/index.htm The three sections are

competitively priced at £10 each to register, alternatively, you can order the whole program on a CD from the website for £28. The files self-install into Flight Simulator 2000 - a double-

click and you can take off from any one of 54 UK airfields. For Flight Simulator 98 the usual procedures for installing scenery apply. But never fear, the meticulous Mr Summons has provided manuals for each area. How wonderful if everyone did that?

The small local fields that we have flown from such as Thruxton with its motor racing track, Old Sarum with the lovely old hangars, and Compton Abbas with fences and trees, were uncannily real. Just to taxi around each one was a joy. If you're worried about staggering around these airfields, we got frame rates of between 11 and 15 fps in Flight Simulator 2000 with a 750 MHz machine.

Please bear in mind that these files are not of new UK scenery, but of detailed airfields. We may have to wait to get the complete British Isles landscape as elaborate as we would wish, but in the meantime, you will get a lot of satisfaction and fun from the accuracy and the dynamic extras of this shareware scenery.

Christopher Jarman
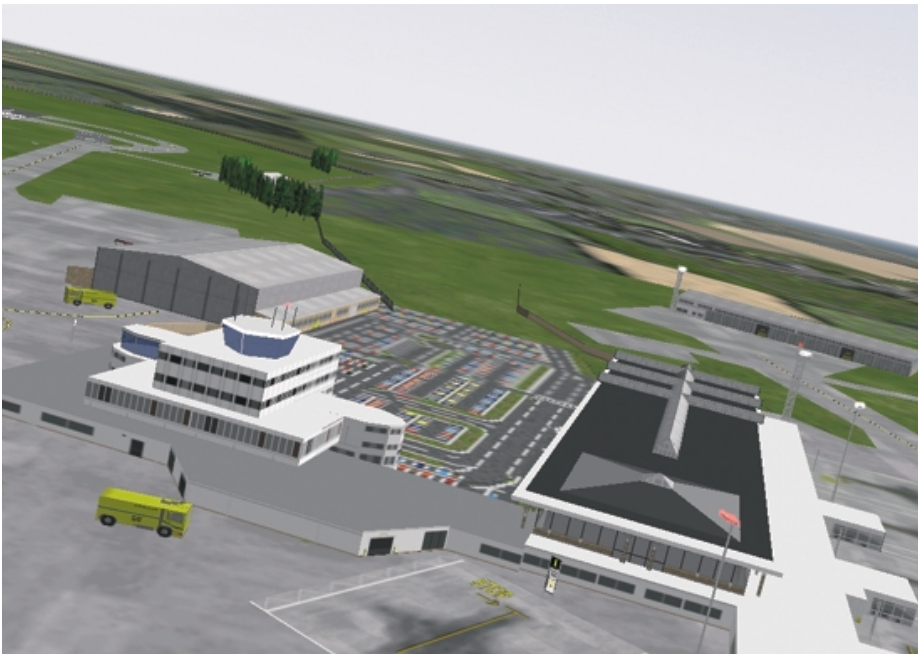
A look at the Bournemouth Airport terminal buildings

REVIEW SCORE:

Publisher:	Gary Summons	**Price:** £28 on CD or
Developer:	Gary Summons	£10 per section
Website:	www.fltman.freeuk.com	**Release Date:** Out Now

At a glance: Obviously of very limited appeal if you aren't interested in flying around the south of England, but if you are, then this a 'must have'.

SYSTEM REQUIREMENTS: PII 266 64Mb RAM, 3D graphics card
RECOMMENDED: PIII 550, 128Mb RAM, 16Mb graphics card

Combat Squadron

Aerial combat with the Pacific Fleet

Most pilots love the challenge of a new aircraft and those that fly under Microsoft's Flight Simulator skies are never short of new craft to test their skills on. You only have to check out our download section to find some of the best freeware designs each month. Alternatively, you can always buy one of the many aircraft compilations from the commercial producers like Just Flight or Abacus.

However, if you prefer the more aggressive nature of Combat Flight Simulator 2, then the choices are far more limited. In fact, we believe that this latest package from Abacus is the first aircraft compilation on the shelves to offer full Combat Flight Simulator 2 compatibility. Although it's true that many Flight Simulator 2000 aircraft can be adapted for Combat Flight Simulator 2, this entails a certain amount of configuration editing and file shuffling, which from the letters we receive, is not something the majority of our readers wish to tackle. However, Abacus new Combat Squadron has dedicated installation routines for Flight Simulator 2000, Combat Flight Simulator 1 and 2.

The Abacus version of the Grumman TBF Avenger

A Freeware Avenger produced by the talented David Eckert

Combat Squadron consists of 18 WWII aircraft models derived from previous Abacus products, namely Pacific Theatre, Battle for Midway, Wings over China and Tuskegee Fighters. They depict aircraft from both sides of the Pacific conflict, all modelled by Terry Hill. As Combat Fight Simulator 2 is based around the Pacific conflict, it will probably enhance the pleasure for many of us to expand the default fleet of American and Japanese

aircraft. The collection includes favourites like the Mustang, Betty, Avenger and Zero, as well as some interesting types like the Brewster Buffalo and Nakajima Oscar.

As a relatively inexpensive package, they don't represent bad value for money, at just over £1 per aircraft/panel set. However, it has to be said that some of the models look rather dated when compared with current aircraft designs from people like Roger Dial, or David Eckert. The Mustang, Thunderbolt and Corsair are particularly noteworthy examples to look for from these designers. The main reason for any criticism is the quite basic nature of the design, with little in the way of external detail, many with non-transparent cockpits and panels that consist of native gauges only, although is this relevant in a combat package?

If combat pilots were only interested in air to air combat there would be little point in having an external model at all, because pilots tend to fly from inside the plane, (most of the time anyway). However, this is obviously not the case and it seems that we all dream of a realism level that is rarely found outside an actual cockpit. So, give us fully operational control functions, let's see the pilot smile and wave as he goes by, show the burn marks on a damaged wing, with bare metal glinting through the blistered paint… OK that's enough dreaming, this sort of reality is still a few years away (or is it? Developers please advise). But perhaps one day…

In the meantime, Combat Squadron offers a fairly extensive range of combat craft for both versions of Combat Fight Simulator, many of which are not available anywhere else. They have tried and tested flight models, optimised for combat conditions, which is important in a dogfight. The last thing you need in the thick of air-to-air combat is a twitchy aeroplane. It's a pity they didn't upgrade the visuals a bit for this release and the addition of a few new missions would have made the package more appealing. In fairness to Abacus, they've not trumpeted this as "new for Combat Flight Simulator 2", it's better

A VIEW OF THE PACIFIC

The Wildcat 'office'

Front seat view in the Shinden

Pilot's view from the Betty

described as some of their old(er) favourites in a handy compilation and ready for another outing in a new combat arena. ■

Joe Lavery

REVIEW SCORE:			
Publisher:	Abacus	Price:	£19.99
Developer:	Abacus	Release Date:	Out Now
Website:	www.abacuspub.com		

At a glance: A compilation that will expand the range of US and Japanese aircraft for CFS2, but nothing we haven't seen before

SYSTEM REQUIREMENTS: PII 300, 128Mb RAM, 3D graphics card
RECOMMENDED: PIII 800+, 256Mb RAM, 32Mb 3D graphics card

A SELECTION FROM THE ABACUS COMPILATION

Curtiss Tomahawk

Mitsubishi Ann

Mitsubishi Reisen

Douglas Devastator

Airfix Dogfighter

Pilot your Mustang around the kitchen?

Most of the time, the articles in PC Pilot are all about realistic flight simulation, reviewing programs depicting aircraft and flight decks that closely mirror their real-world counterparts, where the programmers and designers are forever striving to achieve the greatest realism possible.
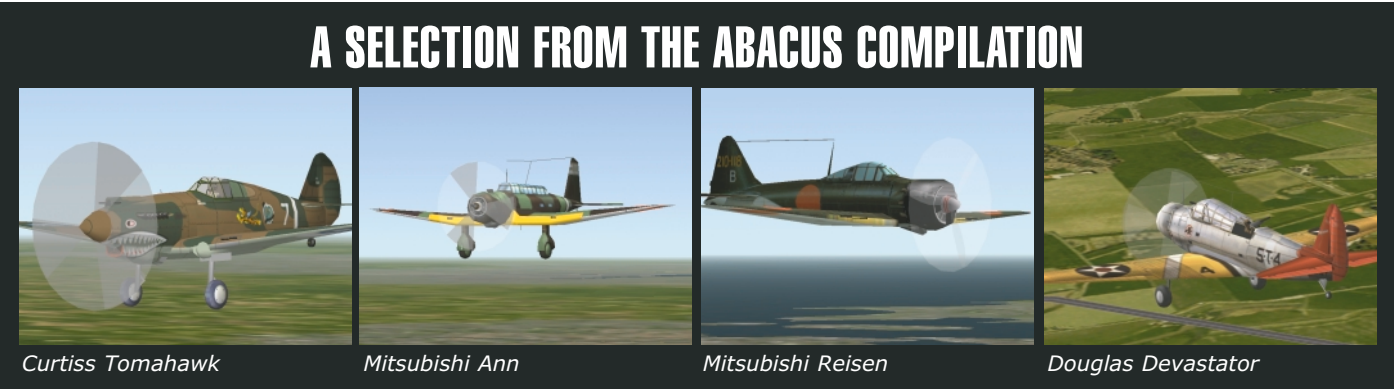
In direct contrast, this latest product from Airfix is precisely the opposite. It doesn't pretend to simulate reality, the scenarios it offers are straight out of fantasy and in essence it's just a bit of fun. However, the games press are keen to place it under the broad umbrella of 'flight sims' so, we thought we ought to give it a quick spin.

It's a fair bet that anyone with a passion for flight will undoubtedly be familiar with the name Airfix. We're not too sure how well they sell outside the UK, but it could easily be called Revell Dogfighter, Tamiya Dogfighter or even Aurora Dogfighter. In our experience, most flight enthusiasts have at some time built model aircraft kits, a hobby that is synonymous with the Airfix brand name. However, this latest 'kit' is something of a new venture, elevating them from the workbench (or kitchen table in most cases) into

Weaving through the furniture to mount your attack

Collect the insignia for more power

This room is used to acquaint you with the objects and flight controls

Did you see which way he went? Check the lounge!

The guns on this P38 make a mess of the ornaments

Up the passage we go, past the shelves, towards the door

the realms of hi-tech computing, with a product that's about as far removed from real flight as you can get.

In Airfix Dogfighter you pilot up to 17 WWII aircraft models, from either the Allied or Axis forces, around the different houses and rooms that make up the playing area. The object of the game is simply to zip around the enormous bits of furniture, collecting or destroying the various artefacts you find scattered around each location. If you come across any other aircraft, shoot them down, because that's precisely what they'll be trying to do to you. In other areas, you'll come across tanks that fire shells with unerring accuracy, which if you don't spot first, will take a great chunk out of your health levels.

The game is set in a three-dimensional world where you take up position directly behind the aircraft you're controlling. These are reasonably detailed scale models, so a flight across the living room takes rather longer than you would expect. The flight

experience is impressive enough, providing your hardware is up to the job and you can get to grips with the controls. In fact, if you have a 3D accelerator the aerobatic makeovers can be quite exhilarating.

Naturally, you are provided with a range of familiar armaments to fend off those enemy forces, including machine guns, cannons, rockets and bombs. These are initially limited in the damage they can inflict but you can increase power to your weapons by collecting the star/cross insignias found inside various breakable objects around the house. As a general rule, if you see something that looks a bit fragile, give it a blast, you'll probably pick up something useful in the debris.

As you would expect, there are obstacles to avoid and some fancy flying needed to complete each level, which incidentally you have to do in order to move on to the next. The same criteria applies to choosing different aircraft, as you progress through the levels you get a choice, otherwise it's the Mustang or… walk.

The program is split into three sections, starting with a rather nice 3D-house designer for creating your own scenarios. This comes complete with all sorts of pre-defined objects for you to add to your world and a few example scenes to get you started. Next, you have the paint shop, where you can customise your aircraft with camouflage colours and your own wing/body emblems. Once again the authors have provided sample files for you to base your designs on. Then finally, onto the game itself, which starts with a fairly gentle introduction to the interface that shows how you should interact with the various objects and adversaries as you come across them.

At the end of the day a product like this has a limited appeal to us serious simmers… (clears throat and lowers voice a few octaves). But we have to say it can be quite addictive… let's have one more go at clearing that bedroom of Panzers…

■

Joe Lavery

The house editor – one for Barratt Homes

Choosing your aircraft

REVIEW SCORE:			
Publisher:	EON Digital	Price:	£29.99
Developer:	Paradox & UDS	Release Date:	Out Now
Website:	www.eon-digital.com		

At a glance: Fun for kids from five to ninety five. Not intended to be serious, but could certainly get younger simmers hooked on flying with their PC.

SYSTEM REQUIREMENTS: PII 350, 128Mb RAM, 3D graphics card
RECOMMENDED: PIII or Athelon 800+, 133 MHz Bus, 256Mb RAM, 32Mb 3D graphics card

AEROBATICS

Have some unashamed fun with your flying

Whether you are visual flying or instrument flying, a key feature of safe controllable flight is keeping the wings level most of the time and never moving the nose more than about 20 degrees above or below the horizon. The more you fly, the more these unwritten parameters become a subconscious part of your flying skills tool bag. It therefore feels very unnatural for a seasoned pilot to move outside this normal flight envelope. Pulling high G takes some getting used to, but hanging upside down in the safety harness, looking up and seeing grass, and having all the dust and any pens in your pockets hit the canopy above your head feels exceedingly unnatural.

There are a few big differences between aerobatics in aeroplanes and on flight simulators. The danger and anxiety elements are completely removed on a PC, of course, as are the G forces. G forces can be significant, however a pilot will notice them less and less with regular aerobatic flights. Although a skilled competing or professional aerobatic pilot would pull higher G's, a typical simple aerobatic sortie would leave about four G positive and one and a half negative G on the meter. These G forces are similar to those pulled on a fairground ride, but the big difference is that in a plane the G forces are held for much longer. Because pilots become used to the G forces, their absence, surprisingly, will not detract much from the realism of the simulation.

The most telling differences when flying aerobatics on a simulator are the difficulty maintaining spatial orientation and lack of feedback through your various senses. During simulation, with the world constantly moving around your field of vision, you need to keep fully aware of where you are in the sky, and your pitch roll and heading. This is much easier in an aeroplane than a PC simulator because of your peripheral vision and the various movement sensors in your body.

Whereas only specialised aeroplanes are capable of performing aerobatics, most

You will need to use rudder to hold your line

simulator planes can fly them. Few simulator aircraft complain if you pull negative or high G forces and you won't need a harness to stop you falling out of your seat, so feel free to try the manoeuvres in a variety of aircraft. You may find it easier to learn some of the basics in a plane that is unlicensed for aerobatics.

Before you start to fly your aerobatics, have a look in the four reference directions you intend to use, such as North, East, South and West, and identify landmarks that you can use to check your heading during each manoeuvre. If your flight is to be a display, two of these directions will normally be along a runway. Also, decide whether you want to start and finish each manoeuvre with a brief straight and level flight for your judges, or for the manoeuvres to flow into each other for your audience. The brief level flight is a good starting point anyway, because it makes sure you are ending your manoeuvres properly. Many aerobatic manoeuvres will have a minimum entry speed, which is dependant on the aircraft being flown. Typical entry speeds are given in the box panel. One final point before we try the

aerobatics is to be sure to turn off any rudder auto co-ordination, otherwise you will find some of the manoeuvres impossible.

The Aileron Roll

This may at first seem the easiest of the manoeuvres when the plane has a sufficiently high roll rate, but there is a sting in the tail. There are three steps to this roll. Firstly raise the nose of the aircraft by about 20 degrees above the horizon and briefly pause at this attitude. Next push the joystick firmly and fully to one side and hold it there, without adding any elevator or rudder. Now for the hard part. Once the plane reaches the upright position again, you have to stop the rapidly rolling aircraft with the wings dead level. This means a degree of anticipation is necessary. The faster the plane rolls, the harder it is to stop at the right place. You may need to move the joystick to give some opposite roll input to finish the roll accurately. If you have difficulty stopping in the right place, try rolling a little more slowly and further slowing the roll rate in the last quarter. Unfortunately, the catch is that if the plane rolls too slowly, your nose will drop too low and things will become

very untidy. If you find that you can't roll fast enough, add a little rudder in the same direction as the roll.

The Slow Roll

Slow rolls are much harder than aileron rolls because the inputs you require are significantly more complex. These instructions are for a roll to the left, which is most beginners' favourite direction. Step one is to raise the nose 20 degrees as before and briefly check forwards on the stick to hold it there. Next move the sick partially, but firmly to the left. The whole manoeuvre should take about 10 to 15 seconds, so use control inputs that give you the appropriate slow rate of roll. The plane will immediately roll gently to the left, and as it does you must reduce the back force on the joystick by slowly pushing it forwards. At the same time add some right rudder. The objective is to minimise the amount of nose drop whilst keeping the plane pointing at about the same place. As the wings roll through the vertical you should have full right (top) rudder and your joystick should be neutral. This neutral position is where no pitching force is generated by the elevators. This is not the same as having no force on the joystick, there is likely to be a slight forward push on a simulator joystick.

For the second quarter of the roll, continue to push the stick slowly forwards. As you do this, progressively reduce the right rudder to the central position. When you are fully inverted you should be able to stop and fly merrily along upside down without gaining or losing any height. In most planes, the nose will need to be well above the horizon to compensate for the asymmetrical wing, which isn't designed for inverted flight. Many aerobatic planes have symmetrical wing profiles and fly just as well upside down. While you are upside down, try a few inverted level turns, including steep turns.

Continue into the third quarter of the slow roll at a steady rate, start gradually adding left rudder and pulling the stick slowly backwards. This time when the

wings are vertical, you should have full left rudder and the stick in the neutral position. The final quarter of the roll is simply a case of reducing the rudder and of continuing to pull back the joystick. Be sure to stop the manoeuvre exactly in straight and level flight.

During the first half of the roll the ailerons and the rudder were working against each other and the plane may have seemed reluctant to roll. If so, you may need to use less rudder. Conversely, on the second half of the roll the aileron and rudder are working together and the plane will try to roll back upright too quickly. The cure for this is to use less aileron. Don't worry about a little nose drop during the roll, it's inevitable in many planes and can be corrected at the mid point and end of the roll when wings are level. Throughout the slow roll, look out of the front windscreen for your visual marker to see how much you are drifting from your initial heading. This visual information will help you determine appropriate balance between rudder and joystick inputs.

Barrel Roll

The barrel roll is one of the easiest manoeuvres to perform. It can be spatially disorientating at first, but it just about retains positive G throughout and does not involve any very low speeds. Hence it is often the introductory manoeuvre for student aerobatic pilots or passengers. A barrel roll involves flying the plane around an imaginary corkscrew in the air. An approximate barrel roll can be flown by pulling back on the joystick to achieve two G and at the same time adding moderate roll input and a little rudder, both on the same side. Simply hold the controls in these positions until the world comes back to its normal place again. To refine this technique, delay the rolling inputs until the nose has reached about 30 degrees above the horizon and progressively ease the stick forward to about zero G in the inverted position over the top, pulling the G back on as you descend towards the ground again. Reduce the throttle as you descend to look after your engine and keep your speed below the red VNE (velocity never exceed) line. Some protagonists insist that the plane should be turned to away from the initial heading before the barrel roll is started so that the corkscrew is around the axis of your heading, but there are an equal number who think this just makes the roll less tidy.
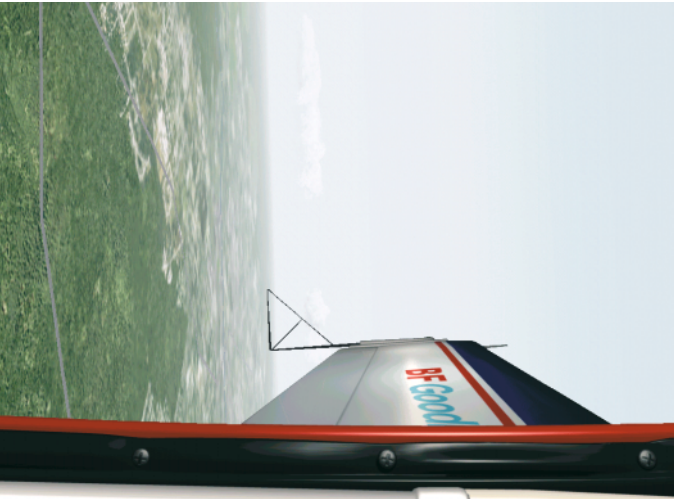
Look to the wingtips to make sure you are perfectly vertical

The Loop

The basic loop is quite easily achieved on a simulator. Simply pull back and hold it there until the view out of the windscreen looks normal again. Although this will work pretty well, you will have probably pulled too much G and the loop is unlikely to be circular.

To dramatically improve the loop, after your dive to build up to the entry speed, pull back on the stick to between three and a half and four G to start the loop. Regularly look at your wingtips to check that they are smoothly drawing a round circle in the sky throughout the loop.

As the plane reaches the vertical, put your head back (press the appropriate key to get the upwards view) to see the horizon. Keep your eyes on it as long as possible, as this is the best way to check how the plane is orientated in the sky. When you reach the second quarter of the loop you will have to pull back less because gravity is working with you. Conversely, you will have to pull a little more because the lower airspeed near the top of the loop reduces the effectiveness of the control surfaces. Gravity usually wins this little contest and the net requirement is to reduce the back pressure. The other good reason for reducing the back pressure is to prevent the wings stalling. It is quite easy to stall over the top of a loop because the airspeed is so low. The consequent buffet is very much stronger than a normal stall from level flight, and can feel like a sledgehammer hitting the bottom of the plane. The cure is to release the back pressure immediately, if you are not quick enough you may well spin or flick. The key message here is not to hurry the top part of a loop. While you are at the top of the loop, look at the horizon and make sure your wings are level.

As you start to descend on the second half of the loop you will need to progressively pull back on the stick to keep the loop circular. Depending on the plane you are flying, you may need to throttle back to prevent either over revving the engine or to prevent the airspeed building too quickly.

TYPICAL ENTRY MINIMUM SPEEDS FOR AEROBATIC MANOEUVRES IN A SMALL LIGHT AIRCRAFT	
Loop	140
Flick Roll	80
Slow Roll	120
Barrel Roll	130
Aileron Roll	120
Stall Turn	120

The airspeed can be controlled to a degree by pulling more G, however this is something to develop as your level of skill increases. Again, as you reach the vertical, you can look above your head to see the horizon and check your progress. As you reach level flight, you can either connect it directly into another manoeuvre or climb a little, using your excess speed to recover some height. You would normally expect the G to be highest as you start the loop, steadily reducing to nearly zero G as you become weightless over the top, and increasing to the four G again as you reach level flight again.

Stall Turn

The stall turn, or hammerhead, is a demanding manoeuvre which normally either works very well or goes horribly wrong. It is particularly difficult to perform good stall turns with a PC flight simulator, because the simulation of very slow slipping flight is often flawed. The ideal place to practise your stall turns is over a right angle crossroads where the roads are straight and continue to the horizon. Start your stall turn by performing the first quarter of a loop. This must leave the plane travelling exactly vertically upwards. Check this by looking at your wingtips and check that the elevator is neutral. Just before the plane stops and starts to slide backwards, quickly put on full left rudder to cartwheel the plane to the left. When the plane is pointing vertically downwards, add some right rudder to stop the cartwheeling and then centralise the rudder again. Keep flying vertically downwards until your airspeed has increased to a good high, flying speed and then pull out of the dive in a similar way to the final quarter of a loop. You should now be pointing in exactly the opposite direction to the one you started on.

If you have tried this, you will probably have found that it is quite difficult to determine the point at which you add the rudder to cartwheel the plane. There are three keys to this problem. Firstly the wind noise will reduce, but this can be difficult to hear. Secondly, if you enter at a fixed speed and pull a similar amount of G entering the manoeuvre, the time to the top of the loop will be about the same. For example, if you start at 120 knots and count "1,000, 2,000, 3,000" you will be close to the turning point. Thirdly, you can watch your airspeed, but this is only partial help, as the ASI needle will have reached the bottom stop at some positive speed. You are also likely to need to add a little right aileron to counteract the roll as you kick in the left rudder. You may need to add a little left aileron in the second half of the roll, but this is fine tuning.

If you are not vertical as you start the manoeuvre, there may be a tendency for the plane to fall forwards or backwards at the top. Despite this, beginners can try

climbing at about 80 degrees instead of vertical, as this can make the turn at the top more manageable. Similarly if you don't wait long enough before adding the rudder, you are likely to roll onto your back because the upper wing will fly faster and generate more lift than the lower one. If everything goes wrong over the top of the stall turn, do not try to recover by pulling

Use aileron in the stall turns to stop you rolling upside down

back or pushing forwards on the joystick, as you will then be using the exact control inputs used to make a plane spin. The best option is to hold tight and wait for the plane to fall into a dive.

There is a way to cheat on a flight simulator if you are having difficulty with stall turns. Surprisingly you will need to have your rudder set to automatic co-ordination. If you want to stall turn to the right, start in level flight with a very small amount of right bank. Pull up to exactly the vertical position and wait. You will be slightly right wing down, which is what you need. Keep looking at your right wing. When you run out of speed the plane will fall to the right but you will need to add some aileron to prevent the plane rolling. You can even stall turn the Flight Simulator 2000 glider this way.

Cuban Eights and Reverse Cuban Eights

The two Cuban manoeuvres describe a figure of eight lying on its side in the sky. They can also be halved to provide an alternative way to turn around to get back to your start point. They are relatively straightforward once you have mastered the loop and the roll.

The Cuban eight starts with five eighths of a loop that is stopped by a firm forward push on the stick when the plane is pointing down at an angle of 45 degrees. Look at your wing tips to check that you are at the correct angle of descent. Once the plane is stable in this inverted steep decent, the plane is rolled upright and then pulled out of the dive to regain level flight. Don't forget to reduce the throttle on the downward leg, otherwise the ground will start to approach

very quickly indeed. Now repeat the manoeuvre to make the complete eight.

The reverse Cuban begins with only the first eighth of a loop, leaving the plane upright and climbing at a 45 degree angle. Once the plane has stabilised, the plane is rolled inverted, and kept on the 45 degree climb. As the speed reduces, the joystick is pulled back to perform the final five eighths of a loop. Again, continue on into the second half of the eight. The reverse Cuban is named quite logically, because it is the exact reverse of the Cuban Eight.

Spinning

The thought of spinning will put terror in the heart of most sane human beings. It is nevertheless a relatively safe manoeuvre when carried out properly in a suitable aeroplane. The easiest way to spin an aeroplane is to reduce power to a low level and hold altitude until the plane is about 10 to 20 knots above the stall. Then firmly push on full rudder to the left, followed quickly by pulling the stick fully and centrally back. Keep holding these controls at their limits until you want to recover from the spin. The plane will rear up and start to roll, but it will ultimately topple into a descent with the outer wing flying and the inner one stalled. This is similar to the
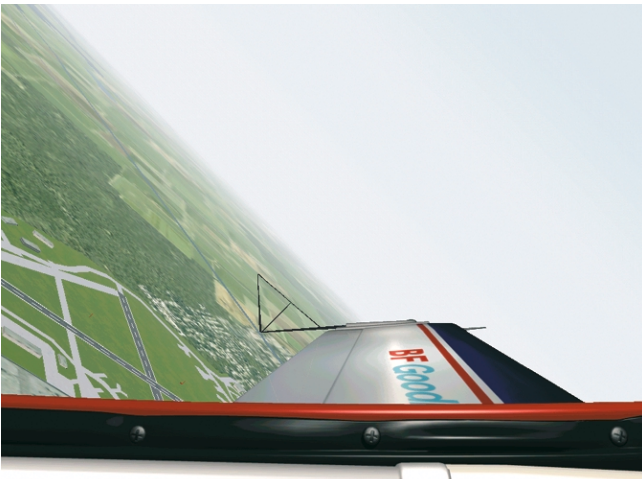
Start your reverse Cuban as soon as you are climbing at 45 degrees

A typical airshow routine - this is what the Eurofighter did for us at Farnborough

twirling flight of a sycamore tree's seed falling from a tree. As with the sycamore seed, the speed will be slower than you might expect for the steep angle of descent. When you have spun enough revolutions, close the throttle, apply full right rudder, wait a very brief period and then smoothly push the stick forwards until the spin stops. The spin will normally stop quite abruptly as the stalled wing starts to fly again. You should keep the plane diving vertically until you have a good flying speed, then fly the last quarter of a loop. You will need a lot of practice if you are going to master the art of stopping the spin on a precise heading.

Spinning to the right is exactly the reverse, however planes will often be easier to spin in one direction than the other because of the direction of rotation of the engine and

propeller. For this reason the amount of throttle used on entry can influence how easy it is to spin the plane. It is also possible to spin a plane inverted by starting upside down and pushing the stick rather than pulling it. Deliberate spinning is relatively straightforward because the recovery controls are the opposite of those used to initiate the spin. The real spinning skill is to handle the inadvertent spin that inevitably happens when learning aerobatics. It can be very difficult to determine which direction the spin is rotating and whether the plane is inverted or not. It sounds easy, but even well practiced pilots can occasionally be confused.

Many actual planes are designed to be difficult or allegedly impossible to spin, furthermore, the simulation of spinning on a PC is usually quite poor. With practise you should be able to achieve some good spins, however if you find them impossible, it may be your simulator that is the problem.

Flick Roll

A flick roll is really a variation of a spin. It is a spin that is carried out with the plane flying horizontally rather than vertically. Fly your plane straight and level quite slowly and apply full power. When the speed has almost increased to twice the stall speed, quickly apply full rudder and almost simultaneously, full backwards joystick. The plane will rapidly

Inverted steep turns will help develop your co-ordination and control

roll. As the wings become level again, rapidly apply the spin recovery controls of opposite rudder and full forward. It all happens quite quickly, so the nose will not have dropped too far during the roll. To reduce the nose dropping, try to find the maximum speed at which you can start the flick. Again, it is difficult to achieve a good flick roll on many flight simulators. Outside flick rolls can be performed by pushing the stick instead of pulling it.

Linking Manoeuvres

So, these are the basics of aerobatics. Once you have managed to perform reasonable manoeuvres, you can add the challenge of linking them together. Ideally you should do this over an airport with a single runway that you can use to make sure your aerobatics stay in a straight line. Once you can link manoeuvres, try designing a sequence for yourself including all of the manoeuvres described in this article. Start adding extra rolls part way through other manoeuvres. For example you can add half rolls in both vertical legs of your stall turns, add an extra roll into your cubans, or try a 360 degree level turn rolling all the time. Add hesitation rolls, stopping momentarily at three, four, six or eight points in your rolls. You can then record your performance over the runway, change your viewpoint to the tower and sit back and watch your own personal air show. ∎

Stephen Heyworth

Twenty years in the virtual skies

A History of Military Flight Simulations on PC

Henry Ford once said that "history is bunk", but as the new year starts we decided to take a reflective glance over our shoulders at some of the famous military flight sim titles that have appeared over the years. All the prophets of doom are certain that we'll never see their like again, so here's a reminder of what the future will be missing. If the experts are right, that is…

The year is 1980. The Olympic Games were held in Moscow, and the U.S.A. did not participate. The 4th Annual Beatlefest Convention was held in Chicago, Illinois. Jimmy Carter was in the White House, and Margaret Thatcher had just come to power in Britain, with an unprecedented switch of the popular vote.

But so what? The real story is that the first flight simulations for sale to the public appeared in 1980, with FS1 for the TRS-80. The world was in travail with the personal computer and computer flying was born.

Fast forward to 1982. Ronald Reagan was in the White House, and Margaret Thatcher was firmly anchored in Downing Street. An almost unknown company by the name of Microsoft released its first flight simulator for the IBM PC. Flight Simulator wasn't much to talk about, but the excitement it generated was substantial.

The PC wasn't the only game in town, of course and games were also being written for the Apple II and for the Sinclair Spectrum. But from here on, we'll restrict our concern to the PC.

The Early Years

In 1983 a startup company by the name of MicroProse released Hellcat Aces for the Atari. Digital Integration got their start in the same year with Fighter Pilot and Charles Guy released Jet for the PC. A year later MicroProse released Spitfire Ace, a game developed by Sid Meier and in 1985 F15 Strike Eagle left the MicroProse stable. The code for F15 was, for the time, a whopping 53Kb. In 1986 Ace was published by Cascade Games and billed as "the Ultimate Jet Combat Simulator".

The first Flight Simulator from Microsoft (image courtesy of Don Schaff)

In reality, the simulations up to this point were generally point and shoot affairs. It was difficult to develop any sense of situational awareness and sometimes even difficult to tell when you hit something. Damage models were almost non-existent, and avionics and weapon systems really weren't simulated at all.

If there is a landmark year in this story, it has to be 1987. This was the year when Air Warrior was born and Chuck Yeager's Advanced Flight Trainer appeared, attempting to teach the basics of flight on the PC, which was a useful preparation for the flight oriented titles that would follow. In the same year Spectrum Holobyte released the first version of the Falcon series and MicroProse released Gunship.

Many simulation fans today count one or more of these last four titles as their 'first love' in PC flying, or at least their introduction to the hobby. Falcon, in 1987, preferred an IBM AT and required 256K to fly under DOS 2.x. It was still too early for the 640K machines or for 256 colour VGA graphics, but the excitement was kindled.

In 1988 there were at least three significant releases for the PC, and among them were Falcon AT and Battlehawks 1942. Battlehawks marked Lucas Arts (more famous at the time for the Star Wars films) entry into the genre, and Falcon AT was a landmark in its own right. A fan at the time remarked,

"I recall walking into the computer department of a large chain and seeing something incredible running with 16 colour graphics. It was perfectly fluid. The voices were incredible. For the first time, I was seeing something that approximated the real world, including joint tactics. It was Falcon AT that pushed me to upgrade to a 386/33."

With Falcon AT, Spectrum Holobyte established their name as a premier simulation developer. The gaming industry was rapidly establishing its own identity, and simulation fans were becoming identifiable as a group.

The Growth Years: 1989-1996

In 1989 Reagan left the White House, and there was an explosion of new simulation titles, although the two events weren't necessarily connected. Sierra released A10

Tank Killer, Blue Max ran in 256 colours (VGA), and MicroProse released Strike Eagle II. Strike Eagle II's environment was as interactive as that in Falcon AT. SAM sites were a constant threat and bandits would pick up the chase on your flight home. Strike Eagle II also offered an expanded view set. The pilot could look to the side or to the back and see the world outside, as well as parts of the cockpit. Suddenly the aircraft itself had internal dimensions.

In the same year Microsoft released Flight Simulator 4.0. This was a true flight simulator, since it modelled the forces of flight as well as aircraft avionics. The program itself looked good at the time, and spawned many add-ons. Interestingly, Flight Simulator 4.0 appealed not only to 'games' fans, but also to a more 'respectable' audience of aviation enthusiasts.

1989 also saw the release of a classic from Lucas Arts called Their Finest Hour (Battle of Britain). George Lucas was a WWII buff and this interest inspired the famous Star Wars dogfight scenes. Incredibly, even this game still fitted within the 640K limits imposed by DOS.

In August 1990 the Gulf War erupted. John Major came to Downing Street and military flight simulations had another surge, with at least eleven PC titles. The classics included Chuck Yeager's Air Combat, Secret Weapons of the Luftwaffe (SWOTL), and Air Warrior. Air Combat had one of the first 'gun camera' features and pop-up windows that helped you keep track of the target. A 256-colour program, it allowed you to fly seven different Luftwaffe aircraft, including experimental jets like the Gotha 229 flying wing.

1991 saw the release of another eleven titles for the PC. Birds of Prey from Electronic Arts included in-flight refuelling! MicroProse F117-A Stealth Fighter featured carrier launches and landings. An atmospheric simulation, F117-A began to show some sophisticated avionics and weapon systems and required some tactical thinking to survive.

Other titles in 1991 included Falcon 3.0, Gunship 2000, Jetfighter II, MiG29M and Red Baron. Of all these, Falcon 3.0 heralded a new generation in simulation technology. It had the first dynamic campaign system, involving the pilot in an ongoing battle, with the forward line shifting with the fortunes of war. Falcon 3.0 was probably the first simulation to have a padlock view, simulating the player turning his head to keep a fix on the bandit.

The inclusion of networking features gave birth to virtual squadrons and a true flight simulation community, even before the Internet was available. Falcon 3.0 also featured a working recorder, allowing the pilot to examine his manoeuvers after the mission from a variety of perspectives.

Finally, Falcon 3.0 offered a hi-fidelity flight model which could be activated on the top end hardware of the time, a 486/33 or higher.

1992 saw nine new titles for the PC and a shift away from jets to propellers. These included Dynamix classic Aces of the Pacific, MicroProse B17 Flying Fortress and Rowan's Reach for the Skies, complete with ground shading!

Novalogic's Comanche and MicroProse F15 Strike Eagle III also came out in 1992. Novalogic, a new arrival in the simulation field, used a new technology called Voxel Space to produce incredible low-level detail for terrain, creating a tremendous sense of speed. Weaving in and out of canyons was sensational. Strike Eagle III allowed multiplayer front seat, back seat flying, and had excellent tutorials. Missions were diverse and challenging and avionics were detailed.

In the same year MicroProse released Fleet Defender, modelling both pilot and navigator positions in the F-14. This one was outstanding for carrier ops, with excellent voice interaction, good wingman control and incredible dawn and dusk lighting. Two manuals detailed weapon systems, tactics and operation of the Tomcat.

Clinton became President in 1993 and there were seven combat flight programs released for the PC. Dynamix published

Aces Over Europe and Spectrum Holobyte released their Hornet add-on for Falcon 3.0. Origin brought out Strike Commander, with high detail texture and a scrolling virtual cockpit.

Digital Image Design (DID) made their first entry for the PC in 1993 with TFX. This required a 486 PC with 4MB of free memory (phew!). Textures were highly detailed and it featured a UN Commander mode, which allowed the player to plan the campaign missions and fly the EuroFighter 2000, F22 or F117.

1993 also brought Tornado, the classic from Digital Integration. With a 330-page manual, it featured detailed mission planning and sported a dynamic campaign system. Tornado quickly became a huge success, as virtual squadrons formed to plan tactics and fly together via modem or LAN.

1994 roared into life with MicroProse 1942: The Pacific Air War, arguably the best WWII simulation at the time. Flight models and the AI held great challenges; almost too much since the AI pilots pulled superhuman manoeuvers. However, graphics were limited to 320x200 but looked good.

In the same year Domark released Flying Nightmares, an AV8B Harrier simulation. Origin brought out Pacific Strike and US Navy Fighters from Electronic Arts was another key title in the crop for that year. Meanwhile, Empire brought out Dawn Patrol, a WWI simulation that still has fans today.

These last two titles both pushed the envelope for raw beauty, with US Navy Fighters allowing up to 1024x768 resolution.

In January, 1995, the first issue of Enemy Lock On was printed, a British magazine dedicated to military flight simulations and along came Activision's A-10 Cuba, using dated graphics but with fantastic flight and physics modelling. Electronic Arts released Marine Fighters, based on the USNF engine. Origin jumped back in with a WWI title, Wings of Glory. The show was stolen, however, by DID's EF2000 and SSI's Su-27 Flanker, the first native Windows 95 simulator.

Su-27 was designed by a Russian team, who modelled systems and aerodynamics in great detail. The 256 colour graphics were becoming dated, but no one seemed to care!

EF2000 set a new milestone in simulation design. Here's a contemporary quote from a review in a Danish gaming magazine:

Falcon 3.0 – versions, releases and series were here to stay

US Navy Fighters and Dawn Patrol – cutting edge for 1994

A two Page advert from the May/June 1994 issue of PC Gamer

"EF2000 is the best all-around modern military jet sim ever, and will probably age very well. Sure, SU-27 has a fabulous flight model and Back to Baghdad has some awesome avionics, but who else puts it together with a dynamic campaign, a decent wingman command structure for good tactical play, and incredible graphics? And the avionics in EF2000 can stand on their own, requiring dedication to learning the systems."

The campaign mode was a real joy and multiplayer co-op single missions were supported. EF2000 defined 'immersion' and the 'willing suspension of disbelief'. It was the first simulation with a fully believable environment and won great critical acclaim.

Sometime around 1995 Electronic Arts struck a deal with Jane's, of civil intelligence fame, to use their name on a new line of serious military simulations. Jane's Combat Simulations was born, with Paul Grace and Andy Hollis (who produced Strike Eagle II and III) the primary personalities involved.

In January 1996 the first issue of PC Ace magazine appeared on newsstands and ThrustMaster released the F22 Pro. Jane's/EA released ATF, built on the US Navy Fighters engine but proving more popular than its parent sim. MSI brought out Back to Baghdad, an F16 simulation based on the Desert Storm campaign. Novalogic's F22 Lightning II left the tarmac, and Philips Media released Fighter Duel. This propeller simulation was specifically designed for multiplayer mayhem, was a landmark work graphically and the first to work online.

Graphics and weapon systems in Longbow 2 were realistic

1996 also saw the arrival of Andy Hollis' first Jane's title, Longbow. Dynamix released Silent Thunder, and Graphic Simulations released Hornet 3.0. Of these, the classic titles were Longbow and Hornet 3.0.

The Mature Years: 1997-2000

In 1996 the whole arena was turned upside down by a hardware manufacturer when 3dfx released a dedicated video accelerator and suddenly the graphical complexity of games leapt forward a generation. Not long afterwards, along came EF2000 v.2 with 3dfx support.

In 1997 Digital Integration released F16 Fighting Falcon with their unique headlock target tracking system. DID followed with F22: ADF, a title that had evolved from EF2000 and was originally intended to be Total Air War. The simulation was innovative enough for DID to scoop two games industry 'Oscars' at Milia d'Or awards ceremony in Cannes. This was the first time that Milia d'Or awarded first prize to a military simulation.

Graphic Simulations then brought out a new version of Hornet 3.0 titled F/A 18: Korea. This detailed simulation of the F/A 18 had the most beautiful skies and clouds yet seen on the PC.

In this same year Looking Glass Technologies arrived with Flight Unlimited III, and Microsoft released Flight Simulator 98. Other titles that year included iF22 from IMagic, US Navy Fighters '97 from Electronic Arts and Joint Strike Fighter was released by Innerloop, with a fanfare of oohs and aahs for the stunning graphics.

Longbow 2 from Jane's came out in mid-year and many consider this the best helicopter simulation ever. With a fully dynamic campaign system and the first use of dynamic lighting seen in a PC simulation, Longbow was both beautiful and challenging. Mission variety was huge and a powerful mission planner made it even better.
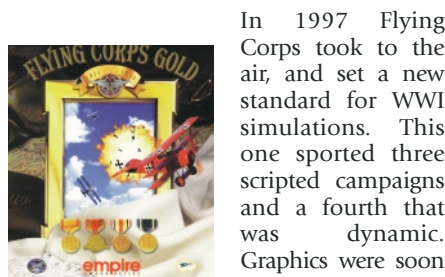
In 1997 Flying Corps took to the air, and set a new standard for WWI simulations. This one sported three scripted campaigns and a fourth that was dynamic. Graphics were soon

updated with 3dfx support and flight models were excellent. With Flying Corps, Rowan pioneered an auto switching padlock system that took the pilot from internal perspective to an outside pilot-to-target view.

Later in 1997 Red Baron II arrived. A new landmark for WWI simulations, this offering from Dynamix sported a fully dynamic campaign system and modelled more than a dozen flyable aircraft. Many users complained about the graphics, which were later updated with 3dfx support in a free patch. Red Baron II is still a favourite with online flyers. The hardware boys weren't standing still in 1997, and this year also saw CH Products release the first force feedback joystick, the Force FX.

The following year heralded the arrival of European Air War, considered by many to be the best WWII combat simulation ever. The initial release allowed only 640x480 resolution, but the flying was atmospheric in the extreme. Voice and sound effects were excellent and the wingman command structure was broad and effective. Flight models were solid and the dynamic campaign sported large flights of aircraft excellent action. A huge variety of end-user modifications have extended the life of EAW to the present day. We also saw the appearance of Air Warrior III in 1998, an online-only simulation that fought with Warbirds for air dominance. Meanwhile, Dawn of Aces took the simulator pilots back to the world of biplanes and Lewis guns once more.

In the summer, the first issue of Debrief appeared, a print magazine dedicated to simulations and strategy games. Jane's F15 set a new milestone for jet combat sims, with the most detailed wingman and AWACS interaction yet seen. Graphics were good on 3dfx, whilst avionics and flight modelling were outstanding.

It as a busy year and continued with IAF, when Electronic Arts finally retired the US Navy Fighters engine. GT Interactive published Team Apache, DID did (pardon the pun) Total Air War and iMagic produced their

An Me262 closing on a B24 in Jane's WW2 Fighters

IF18: Carrier Strike Fighter, which was acclaimed for its campaign system and flight modelling, but plagued with installation and graphics issues.

A highlight of 1998 was Jane's WW2 Fighters, with its advanced graphics and realistic cockpits. The interface was unique, the metaphor a WWII military museum. The aircraft themselves were the most detailed yet seen, and it continues to sell well.

Total Air War was another unique release in 1998 and like F22: ADF, it was destined to win design awards. TAW modelled a huge campaign environment and allowed the player to fly in the war, or to direct the action from a gods'-eye AWACS view. It was great fun and looked great, rivalling Jane's WWII Fighters under 3dfx.

In the autumn Microsoft released their first Combat Flight Simulator, based firmly on the Flight Simulator 98 engine. This release drove seasoned simulation fans crazy by slavishly following the unfamiliar conventions of the civilian series. Combat Flight Simulator appealed to a broad market and has outsold any military simulation to date.

The pace was gruelling, advances legion. Improvements in hardware were enabling programmers to realise many of their dreams, and 3D accelerators were still new to the mix. Rendition and Nvidia were contending with 3dfx.

F16 Multi-role Fighter and MiG 29 Fulcrum rolled out of the Novalogic stable. Both were boxed but aimed at online flyers. At the close of the year, MicroProse released the long awaited Falcon 4.0. This proved to be an amazing program and anyone could see that the depth of the game was fantastic. However, bugs plagued it and many criticised its complexity. The patch finally arrived six months later, but it was beginning to look as if some programs were getting too realistic for their own good.

In spite of these problems, Falcon 4.0 modelled a real time and fully dynamic air and ground war. There was full ATC, a detailed and complex system of communications interaction with AWACS, JSTARS, FAC and wingmen, and it even allowed dynamic entry and exit into the multiplayer scenario. The padlock system was the most flexible yet seen. Falcon 4.0 got a new lease of life almost a year later, as the iBeta team (www.ibeta.com) continued to fix bugs, improve multiplayer features, and release unofficial patches.

Early in 1999 Activision released the highly anticipated Fighter Squadron: Screaming Demons Over Europe. Initially receiving a mixed reception, it continued to improve as the Open Plane module allowed users to create their own game. Graphically appealing and offering solid multiplayer support, it remains popular with many WWII fans.

Dumping chaff and flares and pulling high G's to shake the lock

Also in 1999, the third incarnation of F22 Lightning from Novalogic arrived, updated with support for massive multiplayer sessions on Novaworld. Digital Integration released their long awaited Super Hornet late in the year, heralded as sporting the most realistic avionics ever. While the campaign and wingman interaction was weak, the aircraft and systems were outstanding.

Empire outdid themselves in 1999 with the acclaimed MiG Alley, the first detailed simulation of the Korean conflict, when jets fought with propeller driven aircraft. Modelling five flyable aircraft, MiG Alley also allowed detailed mission planning and significant strategic interaction within the campaign. With outstanding flight models and the best dogfighting action yet seen, MiG Alley remains a benchmark simulation.

For others the highlight of the year was the arrival of SSI's Flanker 2.0. Austere in atmosphere but outstanding in detail, Flanker 2.0 continues to be improved and

A History Book

If you found the idea of a combat sim history entertaining, you might be interested to know that as long ago as 1994 there was a book published about every aspect of flight simulation at the time. It was called PC Pilot (no relation) and when the author, Steve Smith, told us about it, we had to have a copy. It's obviously a touch out of date, but is still a very entertaining read for anyone interested in how flight simulation has developed. We're very privileged to have a couple of copies to give away to the lucky readers who can tell us: *At the time Steve's book was published, which was the current version of Flight Simulator?*

Send your answers by e-mail to **comps@pcpilot.net** or on a postcard/envelope to our address on Page 4. All answers must be in by 5th March when the winners will be drawn.

expanded. Still, others would name Jane's USAF as the best looking and most fun military simulation ever. Modelling eight American military jets and spanning action from Korea to the present day, USAF remains popular and continues to do well at retail.

Razorworks Apache-Havoc also arrived in 1999, heralding a series that would reach a climax with Enemy Engaged in 2000. For civilian simulation fans, 1999 was the year that Terminal Reality released FLY!. This civil aviation simulation was plagued by bugs but has gradually become an outstanding package, incorporating many features that have come to Flight Simulator 2000 only via add-ons.

Meanwhile, Microsoft were uploading the second generation of Fighter Ace, their online simulation based on the Gaming Zone. Fighter Ace II has great graphics effects and levels of challenge vary in different arenas. The boys from Seattle also brought out Flight Simulator 2000 – the latest and best incarnation of their best selling flight simulator, but only if you had the latest and best PC to run it.

We also saw the rot beginning to set in during 1999, with the death of Dynamix and the cancellation of Desert Fighters. Late in the year Psygnosis released Nations: Fighter Command, a WWII simulation that was plagued with problems and rushed out of the door.

The millennium year was led off by the swan song of Jane's in the shape of F/A-18, a benchmark by any standard. Beautiful skies and detailed communications contributed to the sense of involvement.

Razorworks rose to the challenge with Enemy Engaged: Comanche versus Hokum. The fully dynamic campaign is matched by outstanding graphical detail and fantastic gameplay. Helicopter fans had to choose between this and Gunship! from Hasbro. Tracing its origins back to the Gunship! of 1988, this was no match for Enemy Engaged, even though it boasted some of the best graphics ever seen.

This year also saw the release of Simis' Ka52: Team Alligator. Building on Team Apache, Ka52 had greatly improved AI and graphics. As with the earlier release, there was a unique emphasis on team management and morale.

While retail releases have been fewer, online flying is burgeoning. HiTech Creations released Aces High in January and has been constantly upgrading and expanding the world.

In October Microsoft released their Combat Flight Simulator 2: Pacific Theatre. Though reviews are mixed, it is atmospheric, with solid flight models and the most beautiful aircraft ever. It is destined to spawn many add-ons.

And beyond?

From 1980-2000 we have twenty years of combat simulations on the PC. What will the next twenty years bring?

The ones that got away

Through the twenty years of simulation history many titles have been advertised, previewed, and occasionally reviewed which have never been released to the public. 1999 probably holds the record for the most cancellations, with Sierra's Desert Fighters, Jane's A10, Jane's Flight Combat, Sierra's Pro Pilot 2000 and Novalogic's Comanche IV all cancelled in mid flight.

A screenshot from the Flying Nightmares beta.

Others which were greatly anticipated included Infogrames Fighter Duel II, and Eidos' Flying Nightmares II. This last title was under the care of Bryan Walker when cancelled and probably even in beta testing.

Of all the cancellations, however, none was more greatly missed than Jane's A10. This ground pounder was already appearing in magazine adverts when Jane's pulled the plug, and the result was an Internet attempt to reinstate development. Wherever you are, old Warthog, live long and prosper!

The Internet will continue to grow in importance and will impact the quality, style and distribution of military simulations. Programs that create communities will become more important than ones that encourage an isolated experience.

As hardware power continues to increase, so does the feature set and graphical splendour of combat simulations. The challenge for developers is no longer how to make scenery more beautiful or systems more realistic, but how to make the virtual flyers experiences more compelling. Innovation and creativity are alive and well and it's certain we will continue to see great new simulations.

The quality of the simulation experience has been shaped by the marriage of hardware and software and technologies now in their infancy will soon have greater impact. These include force feedback as well as VR headsets and positional and environmental sound.

Currently the number of military simulations in development is shrinking, but production is cyclical, and the fan base continues to grow. Military flight sims will always be around, and some of the personalities who have moved on to other areas will surprise us with new entries. These developers are generally devoted to military history and the fascination endures.

Thanks to Peter "MiGMan" Inglis for the use of some images for this feature. Visit his Flight Sim Museum at www.migman.com
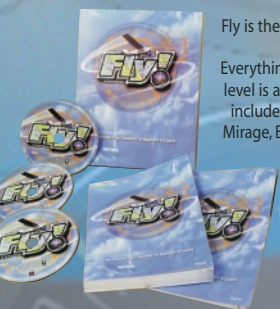
Leonard Hjalmarson

Flight Sim Training

Professional instruction with Bill Stack

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BEFORE YOU START

A few prudent practices that professionals normally apply can make your flights as realistic as possible. The background about this tutorial will also help you enjoy flying while learning about it.

OUR FLIGHTS AND AIRPORTS

In our previous tutorials we have completed a circuit of the British Isles and so we decided to utilise one of the main advantages of simulated flying and hop across the Atlantic for a change of scenery. New Bedford, Massachusetts, will be our destination in this instrument tutorial from Bedford, Massachusetts, a suburb of Boston. The distance is about 50 nautical miles, and the direction is south/southeast. This short-range flight will last about half an hour from take off to landing.

Hanscom Field (KBED) in Bedford, Massachusetts, is a rapidly changing municipal airport surrounded by controversy. A former US Air Force base, it has been a municipal airport since 1974 serving Boston's western suburbs with flight schools, air charter operations, light cargo and private-pilot flights. Hanscom is both busier than the average municipal airport and a small, growing commercial airport. About 400 aircraft are based there, and it has more than 500 daily flight operations.

With strong opposition to further expansion of Boston's Logan International Airport, pressure is mounting on airports surrounding the city to become more commercialised and/or increase passenger and cargo operations. But neighbours of these outlying airports dislike air traffic as much as they do elsewhere in the world. Amid considerable protests and litigations, Shuttle America began flying Dash 8s from Hanscom to New York La Guardia on 1 Nov 2000.

Here's a bit of trivia about Hanscom Field: In July 1945, a B-25 Mitchell bomber crashed into the 78th and 79th floors of New York City's famous Empire State Building, yet the building remained intact. To this day, the incident remains a tribute to the building's sound design and solid construction as well as an object piloting lesson in knowing where you are, what your altitude is and what lies ahead of you. That infamous flight originated at Hanscom.

You can learn more about Hanscom at these web sites: www.massport.com/airports/hansc.html and www.airnav.com/airport/BED.

New Bedford Airport (KEWB) is in southern Massachusetts near Buzzard's Bay, so it aptly calls itself "the aerial gateway to Cape Cod and the Islands." It is a diverse municipal airport offering typical services such as fuel, maintenance and lessons, as well as sightseeing tours and charter flights for tourists. With its average of 240 flight operations daily, it is a fairly busy airport. There are more details about New Bedford Airport on the Internet at www.airnav.com/airport/EWB.

OUR AIRCRAFT

Since we left off last time with the Mooney Bravo, we will fly it again on this tutorial. Its speed will make our flight only about 30 minutes in duration. We will compensate for its brevity with the challenging back course instrument approach at KEWB.

THE CHARTS

Familiarise yourself with the Jeppesen charts used for these tutorials in advance. They show the flight path, fixes and navigation aids. This preparation prevents having to study them during your flights.

As well as the charts reproduced from the Jeppesen Sim Charts program that you'll see in this tutorial, we've included high-resolution images of recent Jeppesen charts on the cover CD. For more information see page 9.

USE FLIGHT PLANS

Be sure to lay out your trip on flight plans. If you don't use the automatic flight planner, use conventional paper flight plan forms. Indicate all your navaids and fixes as well as your estimated fuel needs.

In lieu of filing your flight plan with ATC as real pilots do, imagine that you have filed in accordance with regulations. Keep your flight plan handy throughout the flight so you can easily refer to it. After your flight, file it in a folder or loose-leaf notebook.

NOTE THE TIME

Jotting down the time of significant events during your flight is a good idea even though it isn't necessary when using the GPS. This will show the estimated arrival times at fixes and the destination. Nonetheless, keeping track of your departure and estimated arrival times as well as the duration of each procedure is useful for knowing whether you are on time or will arrive late or early.

COMPENSATE FOR WIND

Deviations from your desired course will consume additional fuel and delay your arrival, so always account for winds in your plan. Refer to our issue 4 tutorial for detailed explanation of wind compensation, the wind triangle and the calculation of wind-correction headings.

MONITOR YOUR PROGRESS AND STATUS

Throughout your flight, check your instruments for the status of your aircraft and engine. Check your position frequently with GPS, radio navaids and/or time/speed/heading. Monitor your engine-temperature, oil-pressure, fuel-flow and fuel-supply gauges. Correct as necessary to maintain desired course, altitude and performance levels.

SIMULATE AIR TRAFFIC CONTROL

This tutorial across Massachusetts will take you through airspace congested with general-aviation, commercial and military traffic using aircraft of all sorts from smallest to largest and slowest to fastest. Real pilots flying in this airspace are under strict ATC guidance and must have clearances for just about every action. In lieu of ATC in your sim, make yourself aware of the nature of this airspace and a pilot's obligations and relations with ATC.

FLY ONE STEP AT A TIME

While leaping over the basics and plunging into advanced flights is a great luxury of flight simulation, it is not realistic. Real pilots do not start at the end of the training course and work backwards, because it deprives them of the skills needed for meeting subsequent challenges. When flight simmers try to meet challenges for which they are unprepared, they frustrate themselves with poor performance and errors. So we strongly advise doing everything one step at a time and building your skills toward the next levels, just as real pilots do.

USE THESE TUTORIALS FOR SIMULATED FLYING

These tutorials are intended for computer flight-simulation, not for real-world aviation or real-world flight training. While making our tutorials as realistic as feasible, we have adapted them out of necessity to the limits and nuances of flight simulation, so some aspects cannot and do not apply to real-world flight. Therefore, we caution everyone to use these tutorials for their intended purposes and we accept no liability for anybody's misuse of them.

OUR AUTHORS

Bill Stack is an expert flight simmer and author of several popular flight sim books. Nels Anderson, our technical consultant, is a certified pilot and president of flightsim.com

Learn more about flying like a real plot from Bill Stack's five flight sim books at www.topskills.com/flitsim.htm

REFER TO OUR PRIOR TUTORIALS

For space considerations, we will not repeat common aspects in every tutorial. If you don't have our previous tutorials, back issues are available from PC Pilot – visit www.pcpilot.net. Issues 1, 2 and 3 are now sold out, but photocopies of the tutorial are available at £3 each (to cover copying and postage) and can be requested from issue1@pcpilot.net or by calling our office on 0870 900 0422 (+44 870 900 0422)

TOPICS FROM PREVIOUS TUTORIALS

Issue	Topic	Issue	Topic	Issue	Topic
1	Taking off, flying straight and level, flying traffic pattern, landing, simple ILS approach. London City (circuit)	3	Attitude flying, VFR dead reckoning, IFR NDB Approach London Stansted - Birmingham	5	VFR scenic coastal flight, IFR fixes, holds, procedure turn, ILS approach Dublin – Glasgow
2	Cross-country flight, VFR pilotage, IFR radio navigation, using SIDs, STARs, IAPs London City – London Stansted	4	Wind compensation, VFR with radio navigation, IFR VOR/DME approach Birmingham – Dublin	6	Night flying Glasgow – Manchester
				7	Global positioning system Manchester – London Heathrow
				8	Fuel calculation Heathrow – Cork

BACK COURSES

APPROACHING A BACK COURSE

The focus of this tutorial is using a back course to approach and land at an airport. A back course is 'the reciprocal of the localizer course for an instrument landing system. When flying a back-course approach, an aircraft approaches the instrument runway from the end on which the localizer antennas are installed' (Dictionary of Aeronautical Terms, Dale Crane, 1997). More simply stated, the localizer will point away from you instead of toward you as you approach the runway. Although back courses are rare compared to other instrument approaches, they are common enough that pilots should know how to use them.

Back courses are tricky, because the CDI (course deflection needles) work in reverse and the glide slope is useless. When the back-course CDI moves to the right, we need to move to the left and vice versa. These actions are opposite to what we are accustomed to – moving left when CDI moves left and moving right when CDI moves right. The glide slope is configured for the opposite runway, so it is not accurate for our use on a back course. Another problem for pilots is that instrument-flight manuals tend to focus on the 'front' course and

ignore the back course. When you fly the approach at New Bedford, you will see firsthand how much a back course differs from the more common front courses and how much adaptation and attention they require.

Most importantly, in the original release of Flight Simulator 2000 back course does not work! It was fixed in the patch so anyone attempting to follow this tutorial must have the patch installed for it to work. This is mentioned in the readme that came with the patch. Just in case you haven't got it, you'll find it on the cover CD.

FLIGHT SETUP

Prepare your simulator for your flight. It takes only a few minutes, and it makes your flight more challenging, more realistic and more fun.

SET UP YOUR WEATHER

For this flight, we will use simulated conditions that existed when we laid out these tutorials in December. The overcast clouds will necessitate instrument flight and block most of the scenery. Set your weather as shown in our weather table.

Today's Weather Conditions

Visibility:	5 miles
Wind:	5 knots
	220 degrees
Clouds:	Overcast
	Ceiling 2,500 MSL
	Top 4,500 MSL
Precipitation:	Light snow
Temperature:	30 F, -1 C
Dew point:	30 F, -1 C
Pressure:	30.01in

Whether you fly during daylight or night is immaterial, because there is no practical difference for instrument flights. Refer to our issue 6 tutorial for details of night flying. To make the flight a bit more interesting, you might try taking off before dusk so you will leave Hanscom in daylight and arrive at New Bedford in darkness, or vice versa.

PREPARE YOUR AIRCRAFT

Be sure to prepare your aircraft for flight before taking off by setting your radios and gauges and turning on your lights. The following conditions generally apply to most flights. Choose the Mooney Bravo, preferably the IFR version. All our time estimates are based on this aircraft. You are free to fly this tutorial in other aircraft later. We will take off from Hanscom's runway 23, because it most closely faces into the wind. Start your flight at this point. Additionally, we will calculate our fuel needs and carry enough for our trip, just as we did in the previous tutorial. Using the method explained in the previous issue, calculate the fuel you will need for this flight. Factor the Bravo's fuel

usage rate, the flight duration and the legal requirements. Remember from the previous issue that our Mooney Bravo uses about 16.5 gallons of fuel per hour from take off to landing.

SET UP YOUR AIRCRAFT

Make your aircraft ready for your flight. 'Buy' enough fuel based on your fuel calculations. Your fuel mixture should be rich and your propeller pitch should be low at these low altitudes. The cowl flaps should be fully open while on the ground and during take off and climbout. The carburettor heat should be off, because it is not needed and its use will reduce performance when the best is needed. The Pitot heat won't be needed unless the temperatures are below freezing and there's moisture in the air. Check the outside air temperature during your flight and turn on your pitot heat if needed. As standard procedure, set your altimeter for local barometric pressure.

TUNE YOUR RADIOS

Although you can rely on your GPS for navigation, you still need your conventional radio navaids for airport operations and as a backup during the enroute portions. Set your Nav1 and Nav2 radios and your OBI for the first frequencies and radials you will use.

SET YOUR GPS

As usual, pilots should know how to use the GPS devices in their simulators, that is, how to engage the devices, change view screens, select data and so forth. I you don't know, check your simulator's manual for instructions.

Engage your GPS by displaying it on your screen, then check the displayed course to be sure it reflects your desired flight path. Don't worry about the SIDs, STARs or IAPs, because the GPS does not reflect them. Set the map for 'north up', 'course up' or 'track up', whichever you like best.

PREPARATION CHECKLIST

(This checklist is for these tutorials, only, and is not intended to be complete.)

Aircraft Settings

Engine:	running
Fuel supply:	adequate
Fuel mixture:	richest
Propeller pitch:	highest
Cowl flaps:	open fully
Wing flaps:	10% (specified by Mooney)
Carburettor heat:	off
Pitot heat:	as needed
Rudder:	straight
Ailerons:	neutral
Elevator trim:	neutral

Gauges

Altimeter:	local pressure
Amperes:	neutral
Vacuum:	green
Oil pressure:	green
Fuel pressure:	24 psi (specified by Mooney)

Radios

Nav1:	117.8 (Sandy Point SEY)
Nav2:	112.7 (Boston BOS)
ADF:	274 (EW)
OBI1:	046
OBI2:	192
Com1:	118.5 (Hanscom Tower)

GPS

Map view:	on
Orientation:	as desired
Zoom level:	as appropriate
Plotted course:	as filed
Displayed:	as needed

Lights

Beacon:	ON
Strobe:	ON
Position (navigation):	ON
Landing:	ON
Taxi:	ON

Clock

Local time or your choice

IFR (Instrument Flight Rules) Tutorial *Part 9*

Reverse Is Right and Usual Is Wrong - Hanscom to New Bedford with a back course

Our Bravo leaves Hanscom
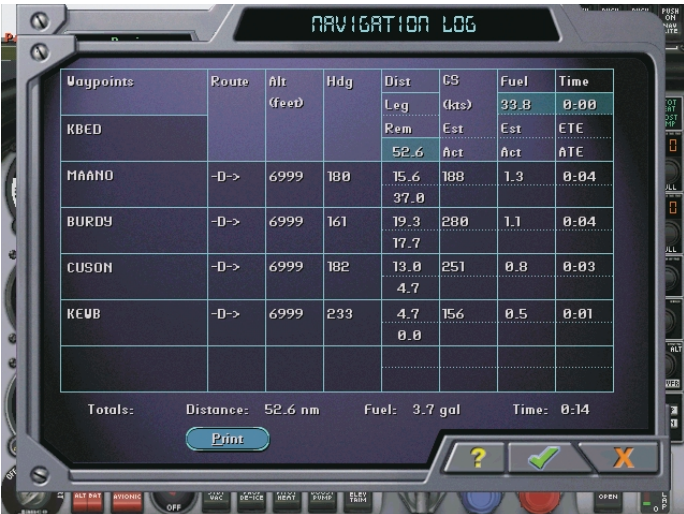
Setting our flight plan

This instrument flight rules (IFR) trip from Hanscom Airport in Bedford, Massachusetts to New Bedford Airport in New Bedford, Massachusetts is simple except for its localizer back-course landing approach. The entire flight is about 50 miles and should take about 30 to 35 minutes from take off to landing.

READ YOUR CHARTS

The charts for today's flight show the instrument procedure for all its portions: 1) departing Hanscom, 2) flying through the busy airspace between Boston and Providence, and 3) approaching New Bedford Airport. Familiarise yourself with all relevant aspects of these charts before taking off so you won't have to fumble around enroute trying to figure them out. Note that some of the instrument procedure charts are not to scale, so the courses depicted on them are not precisely drawn. On these charts, follow the textual directions and use the graphical depictions for comprehension only.

Because ATC guidance is unavailable to us, we will suppose the guidance we might get and rely on our GPS for supplemental guidance.

DEPARTURE

For our departure from runway 23, we will use the Hanscom Six departure procedure. The chart looks more complicated than it is. The text in the upper left clearly states that all aircraft are radar vectored (by ATC) to appropriate fixes depicted on the chart.

Three difficulties with the chart confront us: It is not to scale, the fixes are not accurately laid out in relation to Hanscom or one another and the chart presumes ATC radar vectoring. In lieu of radar vectoring, we will improvise and assume what ATC's radar vectors might be.

The most convenient fix shown on the SID between Hanscom and New Bedford is BURDY. The chart shows that BURDY is at the intersection of the 192 radial of Boston (BOS) VOR and the 046 radial of Sandy Point (SEY) VOR. It is also 55 nautical miles from SEY.

Unfortunately, the chart does not show how to get to BURDY
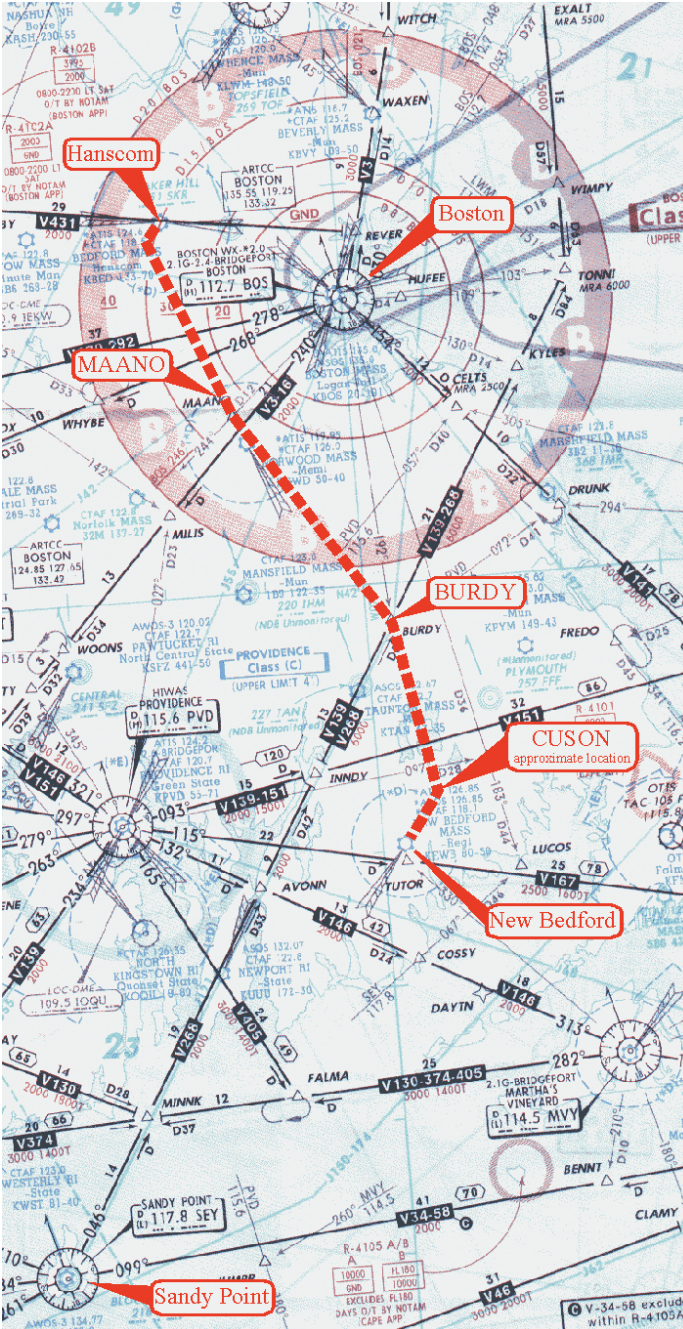
Our chosen route

directly from Hanscom. To get to BURDY using the guidance on this chart, we would have to fly east to BOS, which is about ten miles out of our way and involves flying right over busy Logan International Airport, then head south along its 192 radial until we intercept SEY. Instead of this awkward procedure, we will assume ATC clearance for a more direct course to New Bedford. First, we will fly to a fix shown on the enroute chart (MAANO), then we will proceed to BURDY. The GPS device will show these fixes on the map view.

The entire SID from take-off to BURDY is about 30 miles and should last 15 to 20 minutes.

ENROUTE

The enroute chart doesn't show any airways between Hanscom and New Bedford. Therefore, we will simply head southeast from BURDY toward the first fix on the New Bedford approach chart (CUSON).

ARRIVAL

New Bedford Airport's arrival chart is not much use to us, either. It directs aircraft to New Bedford

from Providence, which is to the west and quite out of our way. Therefore, we will simply follow the instrument approach chart for the back course of runway 23.

APPROACH

Like the Hanscom SID, the IAP for New Bedford runway 23 also presumes radar vectoring. This explains why it shows no clearly labelled initial approach fix or reference data that lead to the back-course localizer. In lieu of radar vectoring, we will simply head southeast from BURDY to the CUSON, then follow the back-course localizer to runway 23.

PLAN YOUR FLIGHT

Based on these charts, lay out the course you will fly from Hanscom to New Bedford. Include all the airways, navaids, intersections and fixes shown on the charts.

If you use Flight Simulator 2000's electronic flight-plan feature, you can include all relevant navaids, intersections and fixes. If you use this feature, your GPS will show your course to these fixes and the destination airport. If you chose to not use it, you will need to head in the general direction until the fixes appear on the GPS map, then head for them. You might try the flight once with electronic flight-planning and once without for the different experiences.

Enter the following data, or have the planner choose them for you.

Departure: Hanscom Airport (KBED) Runway 23

Arrival: New Bedford Airport (KEWB) Runway 23

Alternate: Newport Airport (KUUU)

Waypoint: MAANO

Waypoint: BURDY

Waypoint: CUSON

Altitude: 5,000ft MSL

The electronic flight planner is handy, but the old-fashioned paper charts and flight plans are still useful for seeing our course and estimated times at a glance.

PREPARE YOUR AIRCRAFT

To make your aircraft ready for this flight, use our abbreviated checklist in our Flight Setup section.

TAKE OFF

Take off normally, including cockpit preparation and appropriate ATC clearances, as explained in our previous tutorials. Additionally, check the your engine instruments. The Bravo's manifold pressure should be at or above 38, and the oil pressure should be at least 24. The Bravo should lift off at about 60 to 65 knots. If you use other aircraft for this flight, its performance characteristics will differ from these.

Climb out at about 85 knots. During your climbout, adjust your cowl flap
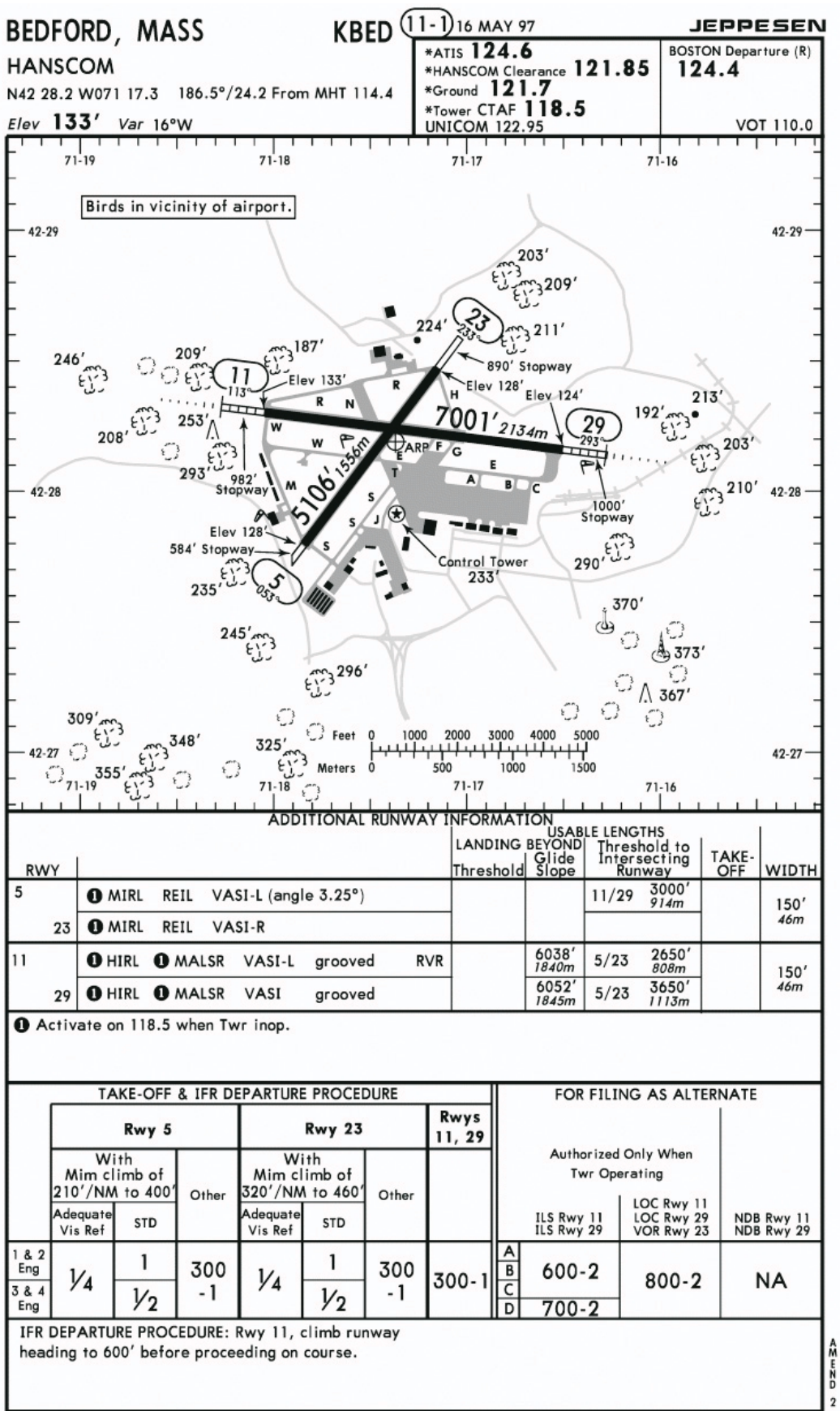
Hanscom Airport

as necessary to keep your engine temperature in the green range – not too hot or too cool. Retract your flaps at about 90 knots. After your initial climbout, your Bravo should be able to climb easily at 700 feet per minute and 120 knots.

The SID does not prescribe any climb rates, but it clearly indicates radar vectoring and interim altitudes while awaiting radar vectoring. In lieu of this assistance, climb to 2,000ft (610m) MSL as specified. When you reach this

maximum altitude, head toward MAANO intersection. If you are using the GPS course/tracking feature, intercept the course to MAANO and proceed along it until you reach the fix. Otherwise, head about 170 toward this fix.

DEPART HANSCOM

Hanscom Six calls for radar vectoring from ATC. In lieu of this guidance, we will assume the vectors ATC might give us.

With the Class D airspace at Hanscom extending five miles in all directions, you will reach its boundary two or three minutes after departure. When the five-mile ring around your aircraft on the GPS map crosses Hanscom, you are at its boundary. At this point, we will assume ATC clearance to climb above the 2,000ft MSL specified minimum. Begin climbing to our cruising altitude of 5,000ft

(1,525m) MSL. Notify Hanscom's ATC as you leave its airspace.

As soon as you climb above 3,000ft (915 meters MSL), you will enter the airspace of Logan Airport. (Note on the enroute chart that Hanscom is right under the perimeter of Logan's 3,000ft, 915m MSL veil.) Pilots are required to communicate with an airport's ATC whenever travelling through its airspace. You will remain in Logan's airspace for about another ten to 15 minutes.

As you climb to higher altitudes, your engine will behave differently. It will have less oxygen to breathe, so you will need to adjust the fuel mixture to compensate. If you don't, the engine will not perform well at all. The engine is performing best when the TIT (turbine inlet temperature) gauge reads 1750, so adjust the mixture until the TIT returns this reading. Do not exceed 1750, however. Again, these performance readings do not apply to other aircraft.

You can conserve fuel by changing the propeller pitch at higher altitudes. We found that the Bravo cruises easily at 170 knots and uses 15.16 gallons of fuel per hour with the following engine settings: RPM 2,000, manifold pressure 30 and TIT (1300). If your engine is using fuel too fast, you could run out of fuel short of your destination.

Once you have attained our 5,000ft (913m) cruise altitude, you may engage your autopilot or maintain altitude and heading manually. Be sure your cowl flaps are closed whenever cruising. They are not needed, and they increase drag.

Getting to the MAANO, BURDY and CUSON fixes is easy with GPS and difficult, yet not impossible, without it.

If you are using the GPS course plotter, which shows on the map screen the courses from origin airport to the fixes to the destination airport, simply follow those course lines for each segment. If you are using GPS but not the course plotter, use a heading that leads you in that direction, then head for the fix when it appears on your GPS map screen.

The only ways to reach these fixes without GPS are radar vectoring, which we don't have, or following the VOR radials, which is too much trouble. In flight simulation, we can fly toward the fix at a certain heading and assume we reach the fix when we intercept the respective radial. This method would not do in real-world aviation, but we lack the ATC assistance those pilots enjoy.

For example, to get to MAANO without GPS, head 170 from Hanscom. When you intercept the BOS 244 radial, where you should be 12 miles from BOS, you are close enough to the fix.

When you reach MAANO, change course as necessary toward BURDY. If you are using the GPS course plotter, follow the course line to BURDY. Otherwise, the heading is 160, and you should adjust course as necessary when BURDY appears on your GPS screen. Without GPS, you will know you are at BURDY when you intercept the BOS 192 radial at your 160 heading.

At BURDY, you will be about 17 miles from New Bedford. Head 180 toward CUSON, begin descending at 500 feet per minute and reduce airspeed to about 120 knots. Switch your Nav1 radio to the localizer frequency 109.7, and monitor the needle on OBI1. Adjust your altimeter for local barometric pressure and your propeller and fuel mixture as you descend through the altitude layers. Remain about 1,800ft (550m) until you pass CUSON, as shown on the chart.

Check your fuel supply. If you estimated fuel needs accurately and embarked with the needed amount, you should have plenty of fuel to reach your destination. Fuel supply should not be a problem on such a short flight; but if your calculations

were wrong, or your engine is using fuel faster than expected or your aircraft is leaking fuel, you could run out short of New Bedford. Look for an emergency airport if necessary.

APPROACH NEW BEDFORD

As you get closer to the airport, readjust your altimeter for local pressure, turn on your landing lights, switch to the tank containing the most fuel, adjust the propeller and fuel mixture as needed, and check your fuel quantity again. If you are dangerously low on fuel, request emergency landing procedures from ATC. Otherwise, follow the published approach procedure. If you have been using the autopilot, disengage it now.

Getting to CUSON is easy with GPS and a bit more work without. If you are using GPS, simply head for CUSON when it appears on your map screen. If you are not using GPS, head 180 until you intercept the localizer, then turn right and head 234 toward New Bedford airport. You will know you are at CUSON when you are 4.6 miles

DME from the localizer and you hear the outer-marker alarm.

TIP: Make a flight/situation here so you can repeat the back-course approach for practice without having to fly the entire course from Hanscom each time.

After passing CUSON, you will perform three functions simultaneously: (1) descend, (2) contact ATC and (3) follow the localizer. This approach will take about two minutes.

Descend to the 460ft (140m) MSL decision altitude shown on the chart. You could descend gradually at 500ft (153m) per minute, or you could descend at 1,000ft (305m) per minute. This fast-descent procedure will ensure reaching the decision altitude before reaching the decision point (D0.5), which is 0.5 miles from the localizer according to your DME. As a result, you will know whether you will be clear of the clouds at the decision height before you reach the decision point. Whichever procedure you use, do not descend below 460ft MSL until you reach D0.5.

Contact New Bedford ATC when you arrive in its airspace. You have two ways of knowing when you are there: The GPS device will show that you have four miles remaining on your flight, and the localizer DME will show you four miles from the airport. This will happen shortly after you pass CUSON, because it is 4.7 miles from the airport.

Follow the localizer back-course approach to the runway in strict accordance with these instructions:

1. The CDI on your OBI1 will work in reverse to what you have previously experienced with localizer approaches. Instead of the needle being right of centre when you are left of the runway centreline and vice versa, it will do the opposite. When you are left of the centreline, the needle will be left of centre. When you are right of the centreline, the needle will be right of centre. The more you move your aircraft toward the needle, the farther it will move from centre.

2. Consequently, you must respond to this needle exactly opposite of what you would normally do on a localizer front-course approach. When the needle moves left, move your aircraft toward the right. When the needle moves right, move your aircraft toward the left. Force yourself to avoid the natural tendency to move toward the needle.

Approaching New Bedford with the OBI-CDI annoted

3. If a glide-slope bar appears on your OBI, ignore it. The approach chart explicitly instructs pilots to disregard glide-slope indications.

4. Descend to 460ft MSL and travel at about 100 knots.

5. Pay close attention to your altitude, and do not descend lower than 460ft MSL until you reach the D0.5 decision point. Two obstructions are right under the approach path.

6. If you cannot see the runway ahead of you when you arrive at D0.5, abort the approach and execute a missed approach.

7. If you do see the runway at D0.5 and you are in a good position to land, descend below 460 MSL and proceed to a normal final approach and landing.

MISSED APPROACH?

The missed approach procedure calls for flying straight ahead over the airport, climbing to 1,700ft MSL and going to an NDB/marker 4.8 miles south of the airport (NEFOR). When you get to NEFOR, fly a holding pattern at least once, then head 054 along side the airport and repeat the approach.

CONGRATULATIONS

You have successfully landed at an airport using a back course. Well done, indeed!

Keep flying this tutorial to build your proficiency. Apply stronger winds and turbulence and advance to more sophisticated aircraft to make it more challenging if you like. For more information about navigation and instrument flying, read Bill Stack's Flight-Sim Navigation and Instrument Flying for Flight-Sim Pilots www.topskills.com/flitsim.htm.

See you next time.

Bill Stack

New Bedford Airport Chart

NEW BEDFORD, MASS   KEWB   (11-1)   22 JAN 99   JEPPESEN

NEW BEDFORD REGL

N41 40.6 W070 57.4   111.6°/21.4 From PVD 115.6

Elev 80'   Var 16°W

*ATIS 126.85
*PROVIDENCE Departure (R) 128.7
*NEW BEDFORD Ground 121.9
*Tower CTAF 118.1
BOSTON Center 124.85 when Dep inop.
UNICOM 122.95

Birds and deer in vicinity of airport. Smokestack 245' 1.5 NM southeast unlighted.

ADDITIONAL RUNWAY INFORMATION

RWY			USABLE LENGTHS LANDING BEYOND		TAKE-OFF	WIDTH
			Threshold	Glide Slope	LAHSO Distance	
5	❶ HIRL ❶ MALSR	RVR			4248'1295m	150' 46m
23	❶ HIRL ❶ MALSR	VASI-L	4583'1379m			
14	❶ MIRL					150' 46m
32	❶ MIRL ❶ REIL VASI-L				5/23 2900'884m	

❶ Activate on 118.1 when Twr inop.

TAKE-OFF

	Rwys 5, 23		Rwy 14			Rwy 32		
	Adequate Vis Ref	STD	With Mim climb of 280'/NM to 300'		Other	With Mim climb of 270'/NM to 300'		Other
			Adequate Vis Ref	STD		Adequate Vis Ref	STD	
1&2 Eng	RVR 16 or 1	RVR 50 or 1	RVR 16 or 1	RVR 50 or 1	300-1	RVR 16 or 1	RVR 50 or 1	300-1
3&4 Eng	RVR 24 or ¼	RVR 24 or ½	RVR 16 or 1	RVR 24 or ½		RVR 16 or 1	RVR 24 or ½	

FOR FILING AS ALTERNATE
Authorized Only When Tower Operating

	Precision	Non-Precision
A B C D	700-2	800-2

CHANGES: Take-off minimums.

New Bedford Airport

Hanscom Six Departure Chart

JEPPESEN   5 SEP 97   (10-3)   Eff 11 Sep   SID   BEDFORD, MASS   HANSCOM

BOSTON Departure (R) 124.4

HANSCOM SIX DEPARTURE (VECTOR)

TAKE-OFF
All Rwys: Heading as assigned by ATC for vectors to assigned NAVAID/fix. Thence
DEPARTURE
All aircraft Expect radar vectors to appropriate depicted NAVAID/fix. MAINTAIN 2000'. Expect further clearance to filed altitude/flight level ten minutes after departure.

NOTE: This chart is not to scale or proportion

HANSCOM

BURDY

NOT TO SCALE

CHANGES: BDL VOR frequency.

The departure from Hanscom

TUMULT
in the Clouds Part II

Offensive and Defensive Manoeuvres in WWII Combat Simulations

In Issue 7 we discussed the fundamentals of air combat manoeuvres and broke them down into five distinct stages: Detection, Closing, The Attack, Manoeuvring, and Disengaging.

This time around we'll discuss attack geometry and energy, then we'll consider offensive and defensive manoeuvres. We'll also look at one-versus-one and two-on-one engagements and consider some of the basic skills you need to fight and survive in air-to-air combat.

Attack Geometry

Attack geometry describes your aircraft's path to the target. There are three types of pursuit: lead, lag and pure.

Pure pursuit keeps your nose on the target, and there is generally no use for pure pursuit in guns combat.

Lead pursuit cuts the line, with the nose of your aircraft pointing ahead of the target. Lead pursuit requires you to predict where you will meet the enemy and rapidly increases closure rate. Lag pursuit is used for approaching the target, where the nose of your aircraft is pointing at a position in space behind the tail of the target.

Pursuit Curves
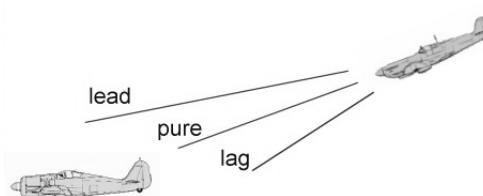
The pursuit

Energy

"Everything in the air that is beneath me is lost." Baron Manfred von Richthofen

There are two types of energy: kinetic and potential. Kinetic energy relates to the actual speed of your aircraft. Potential energy is energy in the bank, since energy is stored relative to the height of your aircraft. At any time, a pilot can trade potential energy for kinetic (motion) energy, or kinetic energy for potential energy.

A zoom climb to 15,000 feet from 10,000 feet reduces kinetic energy (speed) in exchange for potential energy. When the pilot dives on a target at 10,000 feet the equation is reversed, since his speed will climb rapidly. In air combat, energy is life and this is why 'yanking and banking' is usually a death warrant.

Corner Velocity

"Any angles you give the bogey on the first pass will probably haunt you for the rest of the fight."

Lt. Jim 'Huck' Harris, USN Fighter Weapons School

Corner velocity is the airspeed where your aircraft has the quickest rate of turn at the smallest radius. Your ability to maintain corner velocity is affected by altitude and weight. Wing mounted ordnance and fuel are the primary concerns.

When you first pull onto the tail of an enemy, you are generally faster than

the target. By this point you should have reduced your throttle and if your rate of closure is still too high, you may be forced to drop combat flaps. If your speed is too high to allow that option, you will have to resort to a manoeuvre like the high yo-yo. At this point you are engaged offensive with the enemy.

Getting Inside the Circle
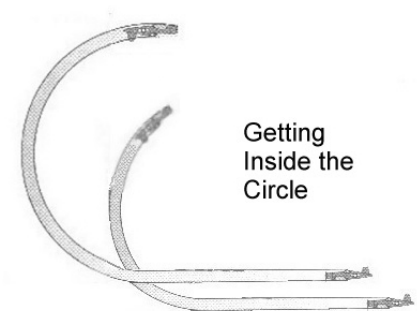
Even as this is happening, if the enemy detects you, he will be thinking about the same issues and his goal will be to maximize his position to place you on the defensive. There are a number of considerations at the merge, but the basic object is to keep your aircraft as close as possible to corner velocity until you can make the kill.

When your opponent starts to turn to evade, he is creating a turn circle. To execute your attack you must get *inside* his circle (which is probably close to his best corner velocity). If you begin your attack on the outside of his circle, the separation will allow sufficient space for him to convert from defensive to offensive and take the fight to you.

Angles and Energy:
One-versus-One Tactics

"I stood on my tail for a moment or two, then let the machine drop back, put her nose down, and dived after the Hun, opening fire straight behind him at close range."

Lt. Col. William A. 'Billy' Bishop VC RFC

The bottom of a loop in a P-51

In considering tactics for use against a similar aircraft there are two approaches: the 'angles' fight and the 'energy' fight. In the angles fight the pilot first seeks to gain a position of advantage, even at the expense of energy. The pilot then seeks to improve that advantage until he achieves a good firing position.

In the energy fight the pilot attempts to gain an energy advantage over the opponent while not necessarily gaining a decisive advantage in position. Once sufficient energy advantage is obtained, it can then be converted to a decisive advantage in position. Each of these approaches has it's own strengths and weaknesses.

The pilot who chooses the angles fight has two choices: turn harder or turn smarter. Seeking the position of advantage doesn't mean the pilot can ignore energy considerations. If the angle fighter gets too slow he will eventually lose his advantage and be forced on the defensive.

Let's suppose that the initial engagement position is neutral. When two fighters meet nearly head-on, the maximum separation that will result as both turn is about one turn circle. At this point the fighter with the advantage will be the one who was closest to his corner velocity at the merge. Most fighters will lose a great deal of energy making their best turn on the first pass, however, creating an opportunity for a tactical advantage.

In fact the tactical advantage begins just prior to merge. When two aircraft close nose to nose they are generally far above their best corner speed. In order to achieve your corner velocity you could use air-brakes, drop flaps or reduce throttle, but any of these mean energy loss. Instead, you could begin a zoom-climb as you come to the merge-see (1) below. You are converting kinetic energy to potential energy. The side benefit is that the climb generates additional flight path separation, useful for executing a lead turn.

So the pilot begins his turn just before the merge, and instead of turning completely in-plane with the opponent, he drops his nose five degrees below the horizon as he turns (3). Even if he loads maximum G to achieve his best turn rate, he will achieve a slight energy

The energy fight

Energy Fight   Top View

Boom n Zoom

The Boom 'n' Zoom
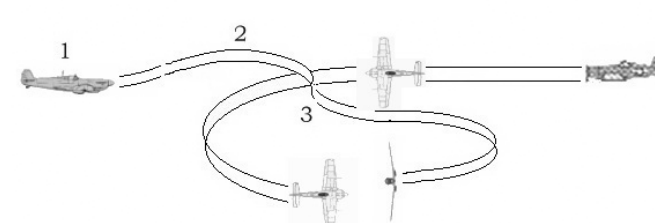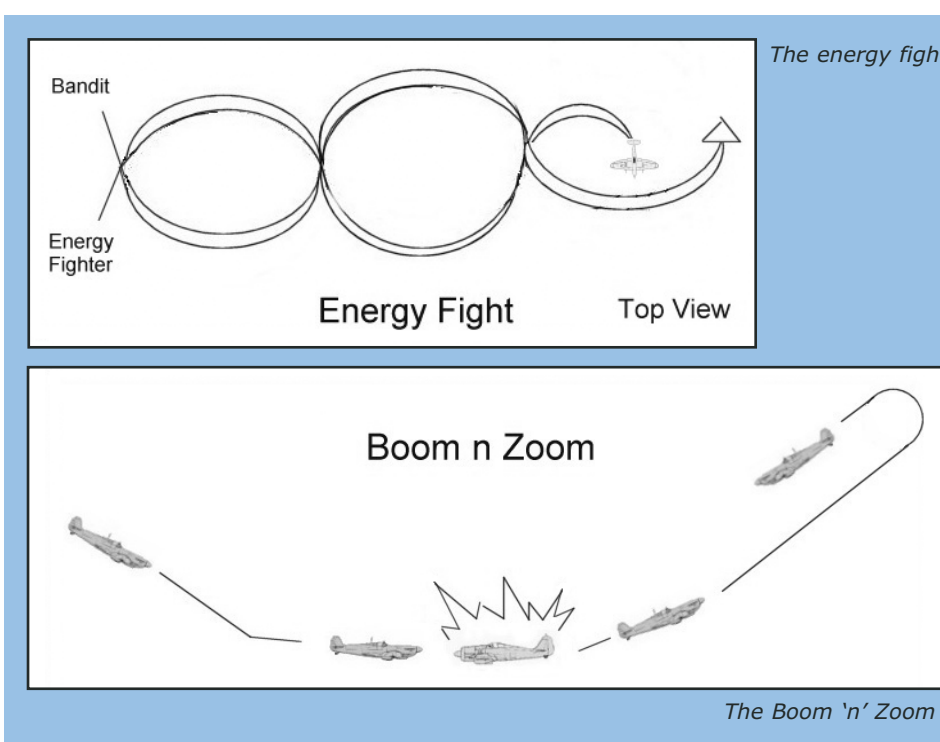
advantage over his opponent. After a few seconds the pilot relaxes G slightly and pulls the nose to level, timing the manoeuvre so that he is climbing up toward the bandit at the next pass.

Although we have only described the first circle, and many fights will extend for three or four passes, some principles of the angles fight are now obvious. What about the energy fighter?

The energy fight involves building an energy advantage and then converting it to a snapshot position. The energy fight involves manoeuvres like the boom 'n zoom, and is often expressed by taking the fight to the vertical.

The rolling scissors provides a method by which an energy advantage can be converted into multiple firing opportunities while remaining on the offensive. The energy fighter cannot be satisfied with a neutral start. The first task is to generate flight path separation for a lead turn. The

A Spitfire gains the advantage in Battle of Britain

Same battle, but in Combat Flight Simulator

pilot is not looking for corner speed, however, so the break away will be made in a level plane. It is assumed that the enemy is skilled and turns into the fighter's attack, taking away flight path separation and generating a neutral pass.

After determining the enemy's turn direction at the pass, the pilot begins a turn

toward his nose at maximum G. Thereafter, the G must be relaxed to maintain corner velocity. A series of nose to nose turns then follows, while the pilot carefully monitors his opponent's turn performance. If the enemy continues to pull maximum G he will quickly lose angles. If the pilot achieves only minimal gains the bandit may also be conserving G and it may be time to exit the fight.

The Angles Fight

The angle approach

Flying wing tactics in European Air War

Another common manoeuvre for the energy fighter, often employed against superior aircraft, is the 'boom 'n' zoom'. The ideal sequence follows: 1. From a position of superior altitude, dive on the target to gain airspeed. 2. Fire at the target as you close. 3. Increase separation beyond the merge. 4. Enter a climb to regain energy. 5. Turn around and repeat the procedure.

The position of the target relative to the attacker and his orientation are critical. The performance characteristics of your own aircraft are also critical. If your aircraft is capable of high speeds you will need to reduce throttle in the dive.

The best type of boom 'n' zoom is vertical. Generally your target cannot return fire, and if he does he will sacrifice speed and become a better target. Furthermore, his manoeuvring options are limited, and all his movements will be within your vision. If he chooses to run, you will have a chance to get on his tail and send him for an early bath.

If the enemy survives your first attack, you should extend to 2000 meters before making another attempt. Your reversal can take one of two forms. The Half-Cuban 8 is best when your energy is high. This manoeuvre involves a 180 degree roll near the top of the loop, and then pulling positive G's as you pull your aircraft toward the ground, using the lift vector to assist you. When your energy state is lower, the Chandelle is best. This involves a half roll, then pulling a horizontal half loop toward the target and then levelling your wings.

Two-versus-One Engagements with Similar Aircraft

"Never break your formation into less than two-ship elements. Stay in pairs. A man by himself is a liability, a two-ship team is an asset. If you are separated, join up immediately with other friendly airplanes."

Major T. B. McGuire, USAAF

The problem with one on one engagements is that they usually become two on one engagements. When this happens to you, look for a way to exit the fight. Before you enter an engagement, you should always know the direction that will take you home or to the nearest help.

Section is the term used to describe a team of two fighters acting together. The concept was first employed in WWI by Oswald Boelcke and Max Immelman. The greatest advantage of concerted action is an improved defence against a surprise attack. Eighty to ninety percent of downed fighter pilots in WWII were unaware of their danger until the attack came.

Fighting wing tactics designate a leader and a wingman. The leader's primary responsibilities are navigation, searching the forward hemisphere for the enemy and attack planning. The wingman flies a loose formation on the leader and his primary task is to monitor the rear hemisphere. The wingman's position is usually not rigid, but rather a conical shaped manoeuvring area behind the leader. Distance is determined by the performance of the aircraft, sufficient to avoid the risk of collision and close enough to maintain contact during maximum performance turns.
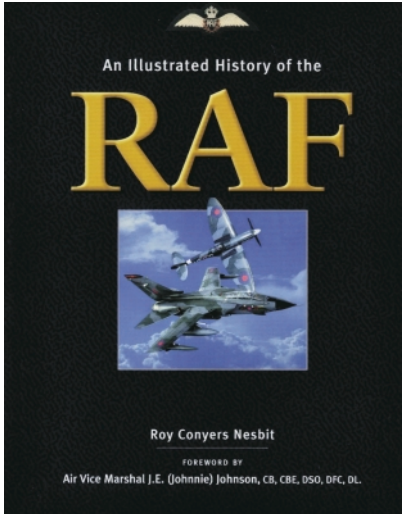
When an engagement begins, the leader fights a one-versus-one battle while the wingman hangs on. His task is to cover the leader's rear. The other advantage to fighting wing tactics is concentration of fire. The flight leader is essentially commanding two firing platforms, or in some cases, four.

There are additional tactical doctrines that build on the advantages of the section. One major variation of fighting wing doctrine is *double attack*. In this model, wingman and leader will sometimes swap roles, depending on position. In most situations of double attack the engaged and free fighter are defined, but not always. If both pilots have the target in sight prior to engagement, they have more manoeuvring choices.

For example, two fighters can make an 'offensive split' where they will attempt to bracket the target, approaching from different angles. If the target is single, he will be forced to engage one opponent, leaving the other free to cover or to get on his tail. If one fighter becomes defensive, the other can take the offensive to free up the defensive fighter.

"In the air you cannot find a general or a colonel. Who has the most kills, he was the leader. It worked very well in the war." Colonel Erich Hartmann, Luftwaffe (352 victories) ■
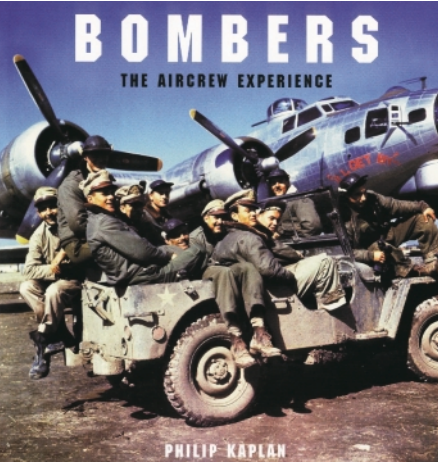
Leonard Hjalmarson

"A man by himself is a liability"

Flying Books

We had some excellent aviation books left in the PC Pilot stocking over Christmas, so here's just a couple that we particularly enjoyed.

An Illustrated History of the RAF

This is a beautifully bound volume and of a size that makes it a welcome addition to your coffee table. The dust cover and bound cover are identical, which is quite handy, if you're like us and like to keep the dust cover in a safe place while you read.

Roy Nesbit is a famous name in aviation publishing and flew forty-nine operational sorties in WWII. Consequently, he captures the flavour of the history as only one who has been there is able.

The large page size lends itself to large photos and illustrations. Aircraft, crews, historical documents and era posters, even squadron insignia are here. With more illustrations than there are pages, this 'illustrated' history is just that.

The book is divided into eighteen chapters and closes with an index of the illustrations. Beginning in the days before winged flight, when balloons were the latest technology, the volume walks through both world wars, through the Cold War and then into the present day.

The text is always cogent and relevant. Since this is RAF history, tribute is made not only to Britain but to her Allies. Attention is given equally to the men and the machines.

Rather than feeling limited to happenings relevant to Britain, one gets a sense of the movement of history, with the RAF at the centre but with many other nations and events happening around that centre.

With roughly 170 pages devoted to the Second World War, the emphasis is clearly on the pivotal nature of that conflict.

How could anyone with an interest in military aviation resist this volume?

REVIEW SCORE:	✈ ✈ ✈ ✈ ✈	
Publisher:	Quadrillion Publishing	**Price:** £25.99
Author:	Roy Conyers Nesbit	**Release Date:** Out Now
At a glance: For an illustrated history, it's almost definitive, but a bit impersonal, despite being written by 'one who was there'.		

Bombers - The Aircrew Experience

Bombers is a riveting time machine in book form, transporting the adventurer back to the men, machines and milieu involved in each era featured. The story is told via period photographs, first person accounts, and historical documents and photographs.

The book is a moody reflection organised into fifteen chapters, not by historical dictum but rather by subject. Instead of walking through history chronologically, Kaplan prefers a journey by association and evolution.

For example, the third chapter is titled 'Learning Curve'. It begins with an account of a mission flown by 97th Bomb Group B-17Es on the 17th of August, 1942. The chapter chronicles the learning experienced by the commanders of WWII as they evolved an understanding of the role of strategic bombing. The following chapter on Delivery Systems moves from 1916 through to the 1990s. The next chapter, Weapons, follows the same progression.

Kaplan's choice of first person accounts is intuitive and effective. The chapter titled Hazards, for example, opens by relating varied recollections of flak.

"Flak is flak is flak, right? Wrong! Depending on your mental state, the same flak that on one given mission might only make your mouth dry and your breathing laboured could, on another day, cause near-panic."

Or take Beirne Lay, Jr.'s account of the Regensburg raid of 17 August, 1943.

"I watched two fighters explode not far beneath, disappear in sheets of orange flame; B-17s dropping out in every stage of distress, from engines on fire to controls shot away; friendly and enemy parachutes floating down and, on the green carpet far below us, funeral pyres of smoke from fallen fighters, marking our trail."

The descriptions are vivid, the photos and illustrations no less so. Bombers is a vivid and evocative tour with the aircrews that flew them through the 20th century. ■

Leonard Hjalmarson

REVIEW SCORE:	✈ ✈ ✈ ✈ ✈	
Publisher:	Aurum Press	**Price:** £19.99
Author:	Philip Kaplan	**Release Date:** Out Now
At a glance: A riveting journey that rivals any dramatic account. Excellent choice of images and stories, but perhaps too broad in scope and could have been even better if spread over two volumes.		

Downloads

More of our favourites from the world of freeware

It seems that each month brings an increasing number of excellent add-ons from the flight sim world, all provided by dedicated amateurs whose only reward is the praise of their fellow simmers. We've sifted through some of the best offerings from this month's batch, (not an easy task with such a lot to choose from) to bring you a few of our recommendations.

Flight Simulator 2000 Aircraft

De Havilland DHC-2 Beaver Mk I - Version 7

Although there are many commendable aircraft variants available for downloading from the Internet, every now and then a superb example appears. This is just such a model, combining superior design, coupled with an attention to detail both inside and out that the commercial producers would do well to take note of. The De Havilland Canada DHC-2 Beaver is one of the most successful and long-lived designs in aviation history and this replica captures the look and feel brilliantly.

Authors: Fred Banting with graphics by Yannick Lavigne
Sounds: Aaron Swindle.
Download From: www.flightsim.com
Filename: beaver7.zip

Pilatus Porter Pc6 B2-H2

This month we have a second absolutely superb aircraft for you, in all aspects of its design and flight dynamics. The Pilatus Porter is provided in two versions, the Parachutist and Extended Range variant, both with unique textures and internal views created using new techniques. Included with these aircraft are probably the most sophisticated air files available to date, as well as two sets of panels and a set of original Porter sounds recorded in Bordeaux.

Authors: Jim Goldman, Yannick Lavigne, Steve Small, Fred Banting, and Marco Rensen
Download From: www.flightsim.com
Filename: fsdpc601.zip

Grumman F-14a Tomcat 3.0.

Now we move to the heavy military metal with a Grumman F-14A Tomcat, in its grey, U.S. Navy tactical paint scheme. Featuring a totally reworked visual model, new and more realistic panel and enhanced flight dynamics. The sound work however is not included (but the author recommends the Top Gun sounds by Aaron Swindle). If you fancy beating up your local airfield like Tom Cruise did, this is the package to get.

Author: Dino Cattaneo
Download From: www.flightsim.com
Filename: f14a2k30.zip

Delta Boeing 777-200 (ProMaxL2)

Camil Valiquette has produced a whole range of aircraft in the ProMaxL2 series. They incorporate maximum moving parts (elevators, ailerons, rudders, flaps with 3D mechanism, spoilers, landing gears and doors). They also feature smoother body shapes and high quality paintwork. The design for this particular aircraft is based on an Air Europe aircraft repainted here by Massimo Grassi.

Authors: Camil Valiquette, repaint by Massimo Grassi
Download From: www.avsim.com
Filename: 777delta.zip

F-86K Sabre "Kaasjager" Klu

The Klu (Royal Dutch Airforce) bought 62 F-86K Sabre's in 1956 and flew them until 1964, when they were all replaced with F-104G's. They were given the nickname Kaasjager (cheesehunter) for the K extension in the plane type. This aircraft model was originally created by Angelo Moneta, a well respected designer responsible for a growing number of Italian aircraft types. The airframe sports a highly detailed 3D model with nicely balanced high-resolution textures, complete with moving parts, night lighting and a photo-realistic instrument panel.

Authors: Angelo Moneta (repaint by Bjorn Groen)
Download From: www.flightsim.com
Filename: f86kklu.zip

Cessna Caravan Amphibian Alpha

This is one of a number of new aircraft designed using Abacus's excellent FSDS. The aircraft has full moving parts (including retractable float gear, rudder and float rudders, flaps, ailerons and elevators). However, the author does not include a panel or sound files but he has provided a set of customisable bmp files for those that want to have a go at repainting.

Author: Graham P. Oxtoby.
Download From: www.flightsim.com
Filename: moser208.zip

Sunstate Dash 8

Sunstate is a wholly owned subsidiary of Qantas and operates in the states of Queensland and northern New South Wales in Australia. The aircraft depicted here has full moving parts including, gear, gear doors, ailerons, elevator, spoilers, flaps and a steerable nose wheel. Texture features include separate textures for gear up/down and full night lighting including strobe effect on upper tail surface and additional night lighting effects with gear down.

Author: Chris Bawden Textures and night lighting modification by Gerritt Kranenbarg
Download From: www.flightsim.com
Filename: qfdash8.zip

Northwest Airlink Saab 340

Most passengers these days are carried in jet aircraft, however this Northwest Airlink Saab 340 by Greggory Payne depicts one of the few remaining prop carriers. The aircraft features full moving parts including rudder, ailerons, flaps, landing gear doors and gear, elevators and props. It also has a transparent cockpit and the author has kindly included the .fsc file for FSDS users who want to customise it even further.

Authors: Greggory Payne; Unique Creations
Download From: www.flightsim.com
Filename: ues340.zip

Boeing 737-200 in Aerolíneas Argentinas livery

This aircraft depicts a 737-200 in the livery of Aerolíneas Argentinas. It has been detailed to a high degree with all the decals in place, including the IATA Member on the lower fuselage. The textures are superb and stand up to very close scrutiny, both day and night textures are included.

Authors: Model by Jorge Oppenheimer, repainted by Daniel R. Careri
Download From: www.flightsim.com
Filename: ar732v1.zip
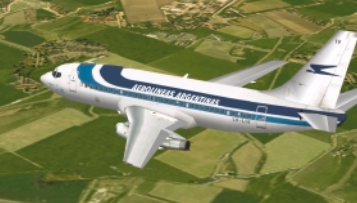
Panels for Flight Simulator 2000

Embraer 120 Panel/Plane

The twin turboprop Embraer 120 is a popular regional aircraft that provides a cost-effective service for low passenger number, short haul flights. The panel/plane set depicted here is a collaboration of many well-known designers and programmers, produced by Bill Grabowski, who also wrote the excellent fully illustrated manual. All the gauges and switches are clearly defined and fully operational, including the brilliant GPS from Alain Capt's. To complete the parcel the zip includes a suitable 120 aircraft from Rafael Hidd and Felipe Taveira.

Author: Bill Grabowski
Download From: www.avsim.com
Filename: fs2kemb120pl_pn.zip

Learjet 60 Panel

This panel is based on an actual photograph of a Learjet 60 cockpit. Designed with photographic realism, (complete with light and shadow) that incorporates superb night lighting effects. The panel has large CRT primary and nav displays, working engine starters, working avionic lights, fire extinguishers and comes with the standard Flight Simulator 2000 GPS.

Authors: Ray Pennington and Jim Turner
*Download From: www.flightsim.com*
Filename: L60_pnl.zip

Utilities for Flight Simulator 98/2000

FSUIPC 2.01.dll

This is the latest update to Peter L. Dowson's excellent module that allows external (i.e. separate) programs to communicate with and perhaps control Microsoft Flight Simulator. It also provides a huge range of options that improve the way Flight Simulator deals with cloud and wind transitions as well as other weather effects. Peter has kindly allowed us to include his latest utilities on our cover CD.

Author: Peter L. Dowson
Download From: www.schiratti.com/dowson
Filename: fsuipc.zip
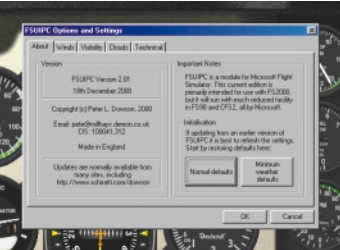
WIDESERVER and WIDECLIENT

Here we have two more module updates from Peter L. Dowson, this time it's his network interface for Flight Simulator 98, 2000 and Combat Flight Simulator II applications using the FS6IPC.DLL interface. This allows you to run FS6IPC controlled applications without having Flight Simulator running on that machine, a typical example being the main display for EFIS98, which using this module can be viewed on a separate monitor. Again, you'll find widefs and widefs98 on the latest CD.

Author: Peter L. Dowson
Download From: www.schiratti.com/dowson
Filename: widefs.zip

Scenery for Flight Simulator 2000

Bangkok Airport

Although this scenery only depicts a single airport, we have included it because the detail level is so high. The author Naphon Sudprasoert has captured the night texture with great skill, as our dawn breaking screenshot shows. Just look at the trees and the realistic way the floodlights light up the taxiways. At present this scenery is only a beta version, so we expect great things from Naphon in the future.

Author: Naphon Sudprasoert
Download From: www.flightsim.com
Filename: bkk2000.zip
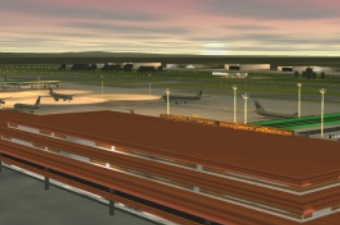
X-Plane

F-16 Falcon

Matt Naragon has produced a very fair example of the F-16 Fighting Falcon for X-Plane fans, complete with a fully operational custom cockpit display. The flight model is a bit skittish, as the author fully admits, but he intends to update it at a later date so we thought the plane was good enough to warrant a mention here.

Author: Matt Naragon
Download From: www.flightsim.com
Filename: f16xplane.zip
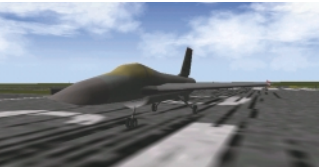
Combat Flight Simulator II

Grumman TBM Avenger

We have seen a few Combat Flight Simulator II models filtering through recently. The aircraft depicted here is from Torpedo Squadron 84 (VT-84) flying from Bunker Hill during the invasion of Saipan in April 1945. Featuring full moving parts (including tail hook) damage/weapons profile and a custom panel. It can also be used in Flight Simulator 2000.

Author: David Eckert
Download From: www.flightsim.com *Filename: tbm_avng.zip*

Will you make the (up)grade?
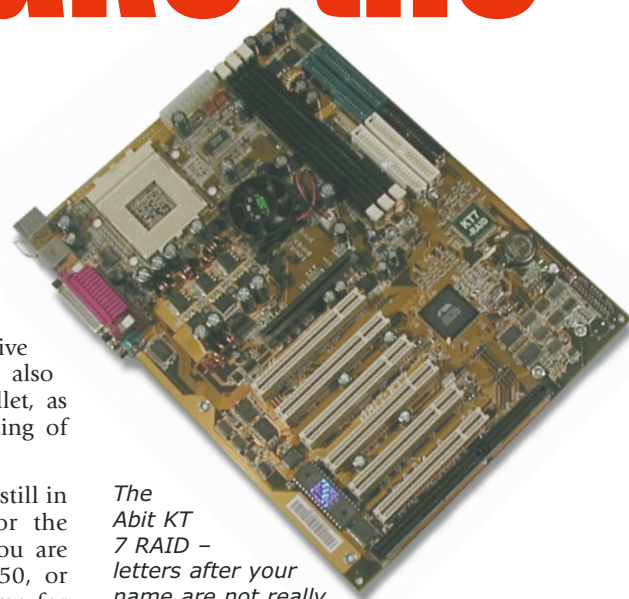
Since we took our first tentative steps in Issue 8 on the perilous road to upgrade utopia, absolutely insane price reductions in several hardware categories have opened up the doors for anyone who wants to improve their flight sim without getting a whole new PC. Memory and processors in particular are at an all-time low, giving many folks the chance to hit the coveted 1GHz speed barrier. Our plan had been to present three possible scenarios around low, mid-range, and stratospheric budgets, however this has been re-evaluated and trimmed down to only two, which should be pleasing to everyone and their bank managers. Originally, we were going to increase the £350 spent in our first instalment to £600 and then to £1000. However, we were frankly amazed at what can be achieved with a little hunting around and just £550.

In short, there can't be a better time to stop putting off the inevitable. Come along with us on a journey of self-discovery, as we invest in some of the latest computer hardware in an attempt to experience virtual flights like never before.

The Next Generation

New memory technology is slowly becoming available to consumers and that means the 'older stuff' gets cheaper. DDR (Double Data Rate) and RAMBUS are the way of the future and sooner or later will be considered for our systems. We could only speculate how the various sims will respond to the increased bandwidth, but certainly bugs are still being worked through and the cost is relatively high. The Pentium IV is out and about as well, which should in theory lead to lower prices for the Pentium III - but does it? In a word, no. Intel somehow manages to keep their prices much higher than AMD's superior 3D performer, the Athlon. Speaking of which, the Thunderbird and Duron retail cost has dropped considerably, making a transition to

this platform even more attractive than ever. Good video cards are also becoming less painful on the wallet, as the end of one cycle and beginning of another is close at hand.

This is great news for those of you still in contemplation mode, waiting for the perfect moment to upgrade. If you are still clinging to that old K6-2 350, or perhaps a Pentium II 400, the time for action has arrived.

Intel or AMD?

This seems to be a most common dilemma for simmers thinking of an upgrade. Intel is a household word and many of us are a bit uncertain about abandoning a platform that has served so well. However, hardware review sites and indeed, our own tests reveal that the AMD Thunderbird outruns and outguns the Pentium III in every simulation we tested, but still, the hesitancy remains to back the new horse in the race. However, with performance, stability, affordability and availability leaning heavily in favour of AMD, it becomes our next platform choice.

We checked out Pricewatch (www.pricewatch.com), a fairly typical site on the net that may be familiar to US readers. Here we found the unbelievable price of $175 (£115) for a 1GHz Thunderbird compared to Intel's 1GHz Pentium III at $435 (£285). This difference seems rather surprising, considering the fact that the Thunderbird can number crunch (in all 3D applications) faster than Pentium. So, as most of us Europeans are crippled by taxes, are these low prices unique to America? We took a trip to RAM Computers

The Abit KT 7 RAID – letters after your name are not really necessary

The Athlon Thunderbird – best value 1 GHz around

of Manchester (www.ram.uk.com) and their site reveals comparable prices of £405 (incl VAT) for the 1GHz Pentium, but only £170 for the Thunderbird. At first glance, considering the exchange rate, it may seem that our potential upgrade is going to be cheaper if we shop over the Internet. However, remember that you'll need to add carriage to any prices you are quoted and many sites may not offer their products outside the home country. Whatever you decide, once a decision is made, you also need to bear in mind that the Thunderbird operates at fairly high temperatures, requiring a large heatsink and fan. This adds about £30 to our cost. So, assuming we shop locally, our purchases have cost us £205, £550-£205= £345 remaining.

Motherboard Choices

This is a somewhat easier task once we have selected our processor. ABIT, ASUS, EPOX, and MSI are top-notch motherboard manufacturers, each marketing a Socket A-based board that will fully support the latest Duron or Thunderbird processors. If you want only the best, meaning fast, configurable, and stable, spend the extra money (£99) on the ABIT KT 7. The MSI and EPOX are much more fundamental and will set you back less, but won't grant you the best performance. The KT 7 is renowned as a fast, stable motherboard, winning several 'best choice awards'. It is worth noting that there are two versions available; the KT 7 and the KT 7-RAID. The latter's four letter acronym stands for 'Random Array of Independent Disks', which the majority of us won't ever use, so it's not worth the extra 30 quid for our

purposes. Comparing these prices to the US again, sees the KT 7 at $130 (£85), which is unlikely to make it any cheaper once it's got across the pond. Acquiring the KT 7 further reduces our funds by £100.00 and leaves us £245. Onward to memory.

Memory

In the last issue we stated that memory was 'in flux' more than anything in the PC world. Today, we can happily report incredible prices on PC133 memory, so amazingly low there simply is no excuse not to have at least 256Mb on board. For instance, 256Mb of 'generic' PC133 memory begins at about £80 over here and $75 (£50) 'over there'. It was only three months ago when that constituted 64Mb worth! Now £100 might get you into name brands like Infineon and Micron, which we certainly recommend for good performance and stability.

You won't need shares in an electronic engineering company to upgrade your PC, just a few simple tools and some space to work. The decor is optional!

cannot supply enough, often resulting in much frustration! A 300-watt or greater power supply is highly recommended for optimum stability and further growth of our system. Bear in mind, like any other component, there are models that are less expensive than others, quite possibly compromising quality. It is always our advice to spend a few extra pounds (dollars, guilders, what have you) to ensure the stability of your system. A rummage around the usual suspects revealed 300watt units starting at £10 and topping out at about £50. The running total now leaves us with £95 to splash around.

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Let us review where we are:

CPU:	1 GHz AMD Thunderbird w/fan	**£205.00**
Motherboard:	ABIT KT7	**£100.00**
Memory:	256MB PC133	**£100.00**
Total Expense:	**£405.00 (remember, these costs include VAT!)**	
Residual Funds: £145.00		

</div>

Power to the People

One of the shortcomings, if you can call it that, of running the Thunderbird platform is the power demands it makes on a system. Throw in a Voodoo5 or GeForce 2 GTS and one might find 235 or even 250-watt units

Absolute power corrupts, but you'll absolutely need 300 watts to run the big stuff

Wrap it Up, I'll Take it!

At this point we have the components selected, but since shipping charges are becoming more of an issue as time moves on, we need to pay close attention to our sources. As we said earlier, beware of e-tailers that tantalise you with a rock-bottom price, but then charge rip-off style shipping fees. We have seen this all too often. Naturally, it would be best to purchase all the goods from one vendor and enjoy lower costs. This is an ideal situation, but does not seem to happen often enough. On the other hand, if every piece is shipped from a different location, our cost has just skyrocketed. Minimum charges are commonly £5-£10 per item for non-international orders. Attempts to ascertain a common denominator for international shipping charges proved fruitless. Actually plugging in the order is the only method that truly determines this added

expenditure. Beware also of sites that charge extra for credit card orders. We saw one site that advised 'Switch and Delta FREE'. Powering up our scanning electron microscope allowed us to see the small print and revealed that 2% was added to credit card orders. In fairness to retailers, this is often down to the cost of processing credit card orders, which can be very high for small businesses. However, forewarned is forearmed. It's also worth haggling over the cost of delivery. Generally, any UK company sending about 40 consignments a night will get a discount of up to 50% from a carrier, but more often than not, you will be charged the carriers' full tariff. On a heavy item this can stack up to substantial profits for the supplier, acting as a middle-man between you and the delivery company. Where there's a profit, there's a chance to haggle, so give it a go, especially if you're spending a couple of hundred pounds on the actual goods.

Assuming a worst case scenario for filling the carriers/suppliers coffers (non-international), getting your gear would be £10.00 X 4 items = £40, leaving £55 out of our original £550.

Attention flight simmers - we have just stepped into the one-gigahertz world for under £500, or about $550 if we went shopping online!

What should we do with the remaining £55? GeForce 2 MX Video cards can be found for very reasonable prices, or you may opt for even more memory, which certainly won't damage your system's performance. What about your sound system? Maybe it's time to retire that old Sound Blaster 16. These are just a couple of ideas; it simply comes down to your personal priorities. At any rate, it bears repeating that high-performance hardware is now more affordable than perhaps at any previous time. Here's hoping everyone is able to enjoy.

Greg Gott

Stick to the point!

Logitech Wingman Strike Force 3D

Logitech takes on the evil empire

OUR CHOICE

In this issue we decided to have a quick look at some of the reasonably priced sticks that are on the market. Our test PC was a 733MHz Celeron II system. We used the sticks with Flight Simulator 2000, European Air War, Battle of Britain and Enemy Engaged.

Logitech first entered the force feedback market with their excellent Wingman Force. This stick is almost legendary among prop combat pilots, allowing the use of separate rudder pedals and easy to program. The original Wingman is ageing, and Logitech recently released two new force feedback sticks: the Wingman Force 3D, and their high end Wingman Strike Force 3D.

The Strike Force features dual 8-way POV hats, in addition to seven programmable buttons, throttle and twist handle. The handle twist function takes care of the rudder, because this stick does not allow use of separate rudder pedals in most cases.

Each of the eight directions on the secondary hat can be programmed to your keyboard or with a DirectX button function using the Wingman software. The hats offer a soft 'click' when deflected. One of the seven buttons is a wheel, just like the one on a scroll mouse. You can click it like a button or scroll it forwards or backwards, offering three functions in one switch. Either of the two large buttons on the base can be programmed as a SHIFT function, doubling the functions of the other buttons.

The Wingman software is excellent

The stick is smaller that the earlier Wingman Force, looks much better and placement of the buttons is intuitive. It's a two-hand job, with the best throttle lever we have seen.

Installation was straightforward, as one has come to expect these days with USB technology.. The stick detected immediately and we checked the properties in Windows ME Game Controller Applet. Performance was flawless, with one caveat. The dead zone is larger than we prefer. This can be amended partially by enabling centre strength over 80% in the force configuration panel, but it is still a bit loose in the centre zone.

This is the most programmable force feedback stick on the market, with powerful and clean effects. The footprint is small and the feel is perfect. Programming is straightforward. What more can we say? In Battle of Britain we actually felt the stall, as we ham fisted our

Controller interface in Battle of Britain

Spitfire over the top, as well as the thump when the Me109s cannons impacted our airframe. The judders of protest can actually be felt, as you take liberties with a 747. You WILL want a force feedback stick once you've tried it.

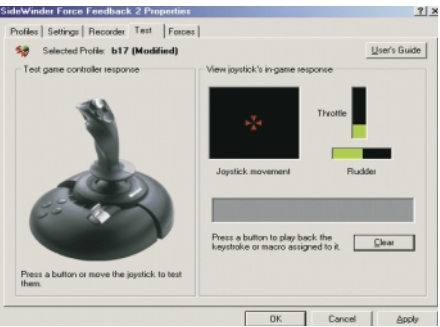| REVIEW SCORE:			
Developer:	Logitech	Price:	£35.99
Website:	www.logitech.com	Release Date:	Out Now
At a glance:	Twin hats and scroll wheel, powerful and smooth force feedback, extensive programmability. Dead zone too loose for some		

Microsoft Sidewinder Force Feedback 2

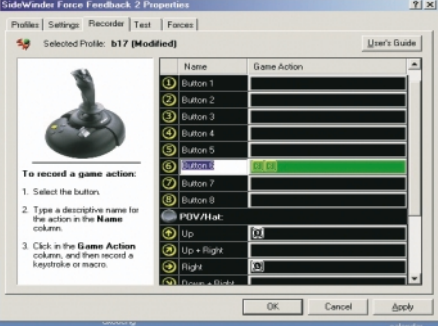### Microsoft's new contender tries to impress

Microsoft's first Sidewinder FF Pro was a solid entry in the joystick market. The positive points of the stick were marred by the huge amount of desk space it occupied and the noisy cooling fan built into the base. Others were put off by the enormous power brick that took up two AC slots on most power bars - how long is it before we will all be cursing the cost as our houses are re-wired for 12V DC instead of mains AC? It would certainly tidy the place up a bit!

The amount of space taken up, or footprint, is smaller now and gone is the serial port - you can have any port you like as long as it's USB. The onboard fan is also gone, and the power brick has disappeared. The thumb wheel throttle of the earlier model has given way to a traditional lever style unit, which makes precise control attainable. Even the hat

switch is transformed, built for the average human instead of the elf-sized unit of the previous model. The twist handle serves the traditional rudder function.

Installation was simple, as it was for the Logitech stick and programming was child's play (so a couple of us here will struggle, but it can be done, honest). Software for this type of device is about as intuitive as it can get and works flawlessly. One can quickly create and save a configuration for any simulation, or use one of the game configuration files provided.

In use the stick seems more precise than the earlier version and it's now on par with Logitech's excellent feel. Seven programmable buttons and an eight-way POV hat grace the unit, but therein lies the fly in the ointment.

For some reason the designers chose to mount three buttons on the top of the stick, creating a diamond formation with the hat at the top. Button placement is not good. Button two can only be activated by trying to roll the middle of your thumb downwards or by removing your thumb from the hat and contorting it downwards.

The other loss to this unit is the shift button, which doubled the programmable functions of the earlier unit. Sadly, the limits to programmability and odd button placement makes this stick a questionable choice for flight simulation fans, especially when you take into account the price.

Sidewinder Profiler software is simple and quick

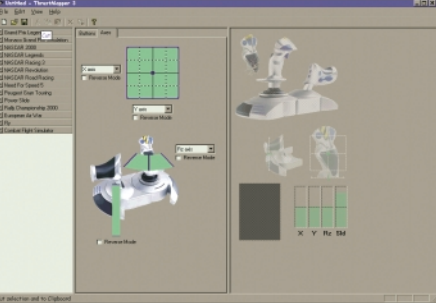| REVIEW SCORE:			
Developer:	Microsoft	Price:	£52.99
Website:	www.microsoft.com	Release Date:	Out Now
At a glance:	Easily configured and tight feel, powerful and smooth force feedback, quick and easy installation. Counter-intuitive button placement, limited programmable functions		

Thrustmaster TOP GUN Afterburner

No force required!

Anyone new to the idea of purchasing a joystick could be forgiven for becoming totally bewildered by the variety of devices and jargon available. Too much HOTAS, FF and USB can soon lead to AO (abbreviation overload). However, since their takeover of Thrustmaster in 1999, Guillemot seem to have continued the tradition of offering a well made product at a reasonable price, with their popular Fox 2 Pro stick. Moving a bit more up market in their range you come across the Top Gun Afterburner pairing. This is a well-styled throttle and stick combination, that can be separated or used as one unit, if you prefer. Once the units are split, using the handy allen key that's included, you can restore the symmetry (and stability) of the stick by attaching the spare 'foot' that's also included. Having the luxury of a large

desk, and not wanting a wire trailing between the two, we preferred to keep the throttle and stick connected, but it works fine either way. It's worth pointing out that the units won't work separately, so it's a case of both or nothing.

All that's required to install the device is to plug in the USB connector and Windows does the rest. You can then install the Thrustmapper software and set about programming the stick and buttons. There are 60 different programmable functions, but the Afterburner is probably more limited than some sticks in its array of buttons. The programming itself is all pretty straightforward and you can set up Thrustmapper to automatically engage particular presets when you launch a program that's associated with them. Quite handy for swapping from aircraft to automobile, or vice versa. One nice function is the ability to choose between a stick-twist rudder or a paddle switch on the back of the throttle lever. You can flick between these rudder controls using a small switch at the base of the stick.
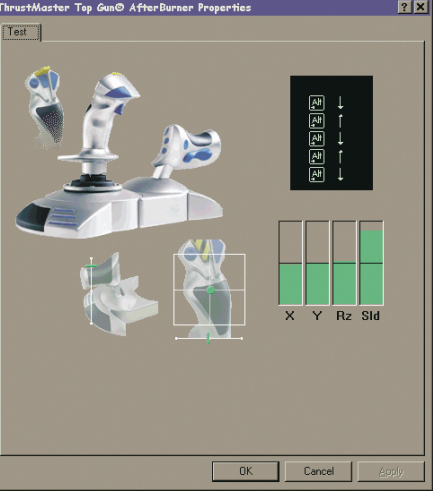
The test panel for the Afterburner combination

In operation the Afterburner is excellent and whilst it hasn't got the luxury of Force Feedback (although an FF version is said to be in the pipeline), the stick resistance can be adjusted by a handy knob located underneath and the unit has a general feel of solidity and quality about it. For a good entry level combination, the Afterburner is well worth considering and won't be totally bewildering for the beginner. ■

Leonard Hjalmarson and Dermot Stapleton

Setting up the axes on the Afterburner

The buttons are also straightforward to program

REVIEW SCORE:			
Developer:	Guillemot Corporation	Price:	£39.99
Website:	www.thrustmaster.co.uk	Release Date:	Out Now
At a glance:	Nicely finished and comfortable to use, can be separated into two units, good entry level device. Rapidly being superseded by other units, not enough buttons for the purist		

Product Listings

Our comprehensive round up showing our favourites from the many products we've evaluated over the months. Please note that the prices indicated are the RRP at original time of release. Be sure to check for bargains at your favourite sim emporium as there are always savings to be made!

CIVIL SIMS

Elite 6.0
Undoubtedly the best IFR procedural trainer there is. So it should be, the frightening price will put off all but the truly serious - the full kit can cost £695.

| Initiative Computing £249.95 | www.flyelite.com |
| | Featured: Issue 4 |

Flight Simulator 2000
Despite much publicised criticism over poor frame rates and misleading PC requirements, this still seems to be the benchmark sim. An awful lot of sim for the money, but invest in a decent PC before buying.

| Microsoft £49.99/£69.99 | www.microsoft.com |
| | Featured: Issue 2 |

X-Plane
Not for beginners or casual flyers, but definitely the 'thinking man's flight sim' - it's even compatible with a Mac, you can fly on Mars (among other places) and we loved the flight model. It also regular updates so Internet access is a must.

| Laminar Research £75.00 (approx) | www.x-plane.com |
| inc. postage | Featured: Issue 6 |

Precision Simulator 744
A no-compromise and no-frills approach to flying a Jumbo Jet. No pretty scenery or advanced terrain but probably as close as you'll ever get to the real thing without a trip to a full motion airline simulator.

| Aerowinx £159.99 | www.aerowinx.com |
| | Featured: Issue 6 |

Airline Simulator 2
Perhaps the best airline flight modelling around with accurate procedures (it's been designed by real airline pilots over many years). Unfortunately not for the faint of heart - old DOS interface and daunting controls a real put-off. Expensive too.

| Just Flight £99.99 | www.justflight.com |
| | Featured: Issue 1 |

Airport Inc.
Take a rest from flying and show BAA how they should really run Heathrow. Fun, yet ultimately limited airport management game.

| Take 2 £29.99 | www.take2games.com |
| | Featured: Issue 4 |

FlitePro
Offers a wide range of training features for the IFR pilot, yet reasonably affordable. Low frame rate for instruments detracts from its overall appeal.

| Jeppesen £99.99 | www.flitepro.com |
| | Featured: Issue 4 |

Fly!
Overshadowed by Microsoft's mighty sim, Fly! has gathered a loyal following. Thought to be better than its rival and some excellent add-ons (and patches) enhance the appeal from when we originally rated it. Available at less than £10 in some stores so a true bargain!

| Take 2 £39.99 | www.iflytri.com |
| | Featured: Issue 1 |

COMBAT

Combat Flight Simulator 2
Quite simply the best all round WWII flight simulator there is. However, make sure you've got a decent PC.

| Microsoft £29.99 | www.microsoft.com |
| | Featured: Issue 8 |

Enemy Engaged: Comanche vs. Hokum
Strikes the balance between gameplay and realism perfectly. Ideal for both rocket junkies or rotorcraft rookies alike. Only downside is no single mission mode and it's not as pretty as Gunship.

| Empire £29.99 | www.enemyengaged.com |
| | Featured: Issue 5 |

Tuskegee Fighters
Beautifully designed aircraft and excellent scenery. The great missions add the final touch of genius. One for any CFS fan's must-buy list!

| Abacus £29.99 | www.abacuspub.com |
| Requirements: CFS | Featured: Issue 5 |

Flanker 2.0
Excellent, with great detail. This is one of the few combat packages that is worth calling a simulation. Online fan base will prolong longevity and interest.

| Mindscape £34.99 | www.ssionline.com |
| | Featured: Issue 2 |

Janes F/A 18
Technically complex with masses of detail and lots of options. Mission builder is nice. Downside is that it is technically complex and you need a high-spec PC.

| Electronic Arts £39.99 | www.janes.ea.com |
| | Featured: Issue 5 |

Janes USAF
Massive potential with formidable collection of aircraft simulated. Pretty graphics and pretty well done, though lacks details purists might seek.

| Electronic Arts £39.99 | www.janes.ea.com |
| | Featured: Issue 3 |

Air Power - The Cold War
Nato vs The Warsaw Pact - relive the days when "njet!" meant "get in the bunker, the reds are coming!" Now with CFS missions and campaigns this has evolved into an excellent add-on.

| Just Flight £24.99 | www.justflight.com |
| Requirements: FS98/2000 & CFS | Featured: Issue 7 |

F/A 18 Super Hornet
Unsurpassed carrier operations and silky smooth flight model appeal. Unfortunately only forty missions and the basic scenery detract.

| Titus £34.99 | www.superhornet.com |
| | Featured: Issue 3 |

Fighter Ace II
If you've got a fast Internet link and you fancy some live (for the moment) opposition, then this is as good an introduction as any to combat on the web. Excellent graphics and a reasonable cost means that, as usual, Microsoft will have a winner.

| Microsoft £6.50 per month | www.zone.com/fighterace |
| Requirements: Internet link/modem | Featured: Issue 7 |

SCENERY AND AIRCRAFT

FS Traffic
Perhaps the best £20 you can spend enhancing Flight Simulator - it really does bring airports to life. Now in boxed and download flavours.

| Just Flight £19.99 | www.justflight.com |
| Requirements: FS98/2000 | Featured: Issue 2 |

Luftwaffe Collection
Oozes authenticity and packed with an eclectic, yet perfectly detailed, collection of aircraft. Some CFS niggles (such as no Quick Combat set-up for the aircraft) only downside. We gave it away free on Issue 6!

| Just Flight £24.99 | www.justflight.com |
| Requirements: FS98/2000 or CFS | Featured: Issue 1 |

Airport 2000 Volume 2
Incredibly detailed renditions of major airports with decent aircraft and adventures. Sadly a frame-rate hog in both FS98 and 2000 and adventures are complex.

| Just Flight £29.99 | www.justflight.com |
| Requirements: FS98/2000 | Featured: Issue 4 |

FS Clouds
Fantastic effects with a minimal frame-rate hit and apart from a few graphic glitches it is a worthwhile improvement on Microsoft's own fluffy stuff.

| Just Flight £24.99 | www.justflight.com |
| Requirements: FS2000 | Featured: Issue 6 |

German Airports 3
Wonderful enhancement for those interested in flying to the Fatherland. Like all beautiful things though, can drain system resources alarmingly.

| Aerosoft £24.99 | www.aerosoft.com |
| Requirements: FS98/2000 | Featured: Issue 4 |

Mad Dog 2000
Now updated and running in FS2000, a very competent add-on that makes FS2000 feel like a different simulator. Not cheap, but it's much more than just one aircraft.

| Lago £34.99 | www.lagoonline.com |
| Requirements: FS98/2000 | Featured: Issue 7 |

Private Wings
A quality collection that all virtual pilots interested in light aviation should consider. Only downside is some aircraft do not feature transparent canopies.

| Data Becker £19.99 | www.databecker.com |
| Requirements: FS98/2000 | Featured: Issue 5 |

Royal Air Force 2000
Eclectic, yet balanced, mix of aircraft with excellent panels and bonus of missions for CFS users. A few clumsy details on some of the aircraft are the only downers.

| Just Flight £24.99 | www.justflight.com |
| Requirements: FS98/2000 or CFS | Featured: Issue 4 |

737 for Fly!
A meticulous re-creation of the 737-500 for Fly! Superb detailing is only let down by blurry external textures.

| Wilco £18.95 | www.wilcopub.com |
| Requirements: Fly! & Fly!2K | Featured: Issue 6 |

English Airports
A vast improvement on the default scenery and while it isn't as instantly impressive as some scenery, it actually works in FS2000

| Just Flight £16.99 | www.justflight.com |
| Requirements: FS2000 | Featured: Issue 8 |

HARDWARE

AFCS II Yoke
Heavy metal control, hand crafted and definitely the Aston Martin of controllers. Eye-watering price to match though.

| AETI £400.00 | www.simpilot.com |
| | Featured: Issue 3 |

GeForce 2 GTS
Fantastic performance, a powerful feature set and frequent driver revisions - probably the current champion (until the next one!)

| NVIDIA £205 | www.nvidia.com |
| | Featured: Issue 8 |

Go Flight GF45
A very useful item - no fuss USB unit that takes the place of on-screen avionics display and keyboard controls - buy five for a full radio stack!

| Go Flight £79.95 | www.goflightinc.com |
| | Featured: Issue 7 |

Voodoo 5 5500
The latest offering from 3dfx, complete with FSAA, that now works in FS2000 as well. Better frame rates and smoother lines, but only those with long pockets need apply.

| 3dfx £249.00 | www.3dfx.com |
| | Featured: Issue 6 |

G400 Dual-Head
One of our favourite cards. 32Mb with nice twin monitor support. Fast, smooth and great value.

| Matrox £150.00 | www.matrox.com |
| | Featured: Issue 4 |

OTHER PROGRAMS

SimCharts
Genuine Jeppesen airport charts (to all intents and purposes) at a bargain price. But they're on the CD and you need a decent printer. Treat yourself to the expensive pack and get printed en-route charts too.

| Jeppesen £19.99/£29.99 | www.jeppesenpcpilot.com |
| | Featured: Issue 2 |

ProFlight 2000
One of the best ATC/adventure generators around, with enough customisation potential for everyone.

| Just Flight £34.95 | www.justflight.com |
| Requirements: FS2000 | Featured: Issue 8 |

Final Approach
Good value package that not only solves the mystery of IFR approaches, but also provides fistfuls of airport plates too. Not for the casual flyer though.

| Just Flight £24.99 | www.justflight.com |
| | Featured: Issue 5 |

FS Design Studio Pro
A great package for designing scenery and aircraft. While relatively easy to use it can be tricky to place scenery accurately when you've finished being creative.

| Abacus £39.99/£59.99 | www.abacuspub.com |
| Requirements: FS2000 | Featured: Issue 5 |

THE *ONLY* HUB FOR VIRTUAL AIRLINES

Pilots win prizes!

Virtual Air2000 was formed in November 2000 with the simple aim of being the best VA out there. They fly international schedule and charter routes from their UK hubs, which are currently Bristol, Birmingham, Manchester and London Gatwick. They are opening new hubs at London Heathrow and East Midlands early in 2001.

They have found that most VAs are just a method for logging pilot hours so they decided to be different and offer something back to their pilots and started a pilot award scheme. This seems like an excellent idea and is likely to make many other VA pilots green with envy. Virtual Air2000 regularly award their pilots with prizes such as add-on software and videos etc., which certainly adds a new dimension to virtual flights. The first prize for this quarter was provided by Just Flight Ltd.

Virtual Air2000 CEO Nick Gage told us: "We are committed to our pilots and encourage their feedback to improve the airline. We currently have pilots from the UK, USA and Asia and one of the few female pilots in VA land."

So, although we haven't found a VA (yet) that pays its pilots, a bit of competitive incentive seems like a great idea to us. ■

Derek Smalls
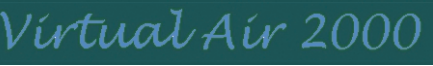
Virtual Air 2000

CONTACT DETAILS:
Nick Gage – CEO
ceo@air2000virtual.com
Website: www.air2000virtual.com

MORE VAs AROUND THE GLOBE

WESTWIND VA
This VA boasts some pretty challenging schedules, with over 3,000 pilots in its ranks. If you're up for it they've got room for more pilots.
WEB: www.flywestwind.com

JERSEY GROUP OF AIRLINES
A VA group that includes Jersey Euro Link, Jersey Cargo Link, Jersey Sun and is described as "based more on fun and freedom than on regulations".
WEB: http://members.tripod.co.uk/jeurolink

BAHAMASAIR VA
Offers world-wide destinations in addition to extensive services in south eastern United States, Bahamas and surrounding Islands.
WEB: http://cybermoo.net/bahamasair

KTEAM FLYING GROUP
Not strictly a VA, but a flying team that go to fly-ins and tournaments with their aerobatics group. Well worth a visit if you can keep your lunch where it belongs when you're pulling 6G.
WEB: www.kteam.homestead.com/kteam.html

EASTERN VIRTUAL AIRLINES
A VA that's been up and running since August last year and now boasts over 300 pilots in their ranks. Eastern VA have real 757 and 767 pilots available to answer questions.
WEB: www.evair.com/index.htm

BRITISH AIRWAYS VIRTUAL
British Airways Virtual started life in April 2000 with the aim of making flying with a virtual airline both a rewarding and enjoyable experience.
WEB: www.bavirtual.co.uk

TEXAS AIR CARGO
Texas Air Cargo operates out of the new Austin/ Bergstrom International Airport at Austin, Texas.
WEB: www.geocities.com/texas_air_cargo/

VIRTUAL BRITISH CALEDONIAN AIRWAYS
VBCA is a virtual airline that is targeted towards the UK and European flight simmer.
WEB: http://avsim.com/hangar/air/vbca/index.html

POLAR AIR VA POLAR AIRWAYS
Hub based at Amsterdam Schiphol Airport (EHAM) and offices at Almere in the Netherlands.
WEB: www.polarairways.com/

VIRTUAL DELTA AIRLINES
This site is primarily for the aviation enthusiast interested in airline operations, especially Delta airlines.
WEB: http://virtualdelta.cjb.net/

AIRKENT UK
AirKent is a VA from London. Currently operating the Airbus A320 family and BAe 146's from its main hub, Gatwick South Terminal.
WEB: www.airkentuk.co.uk/

VIRTUAL AIR COMMAND
Models itself on the real world US Air Force Air mobility Command. Here you can fly all the big USAF heavies.
WEB: www.geocities.com/CapeCanaveral/Campus/6174/

VIRGIN SUN
Based at Birmingham International Airport, they operate from there as well as from London-Gatwick to and from sunspots around the Globe.
WEB: http://members.aol.com/Afre63456/vvs/

SUN CHARTER INTERNATIONAL
This is a new airline operating from the merger between BAC and SLJ, within the UK to European resorts and across the Atlantic.
WEB: http://sun_leisure.homestead.com/index.html

MANCHESTER AIRWAYS VA
Manchester Airways is one of the UK's newest generation of Virtual Airlines. With its extensive UK network operating out of Ringway (Manchester).
WEB: www.wayne11.freeserve.co.uk/man/man.htm

60th HELICOPTER SUPPORT UNIT
A military style outfit that flies choppers in combat roles.
WEB: www.geocities.com/60thvaw/60thhsu/index.html

AIR JET UK
This airline offers you a Gateway to Virtual Airline flying.
WEB: www.flightsimnetwork.com/airjet/

EXCEL AIR
Serving Milwaukee, Daytona, San Diego, Denver, Dallas/ Ft. Worth, Los Angeles, Atlanta, Boston, Washington DC (DCA), Minneapolis St. Paul, and Phoenix.
WEB: http://ourworld.cs.com/FlyExcelAir

VIRTUAL 2000
Currently they fly to more than 90 destinations in Europe. UK-based.
WEB: http://va2000.homepage.com/

SOUTH EASTERN AIRLINES
Opened in March 1999 and based at Hartsfield International Airport in Atlanta, Georgia
WEB: http://free.prohosting.com/~se-air/

ICELAND AIR
They fly to most of the major airports on the US East Coast, Canada, and Europe using real world routes, time tables and of course the correct fleet of aircraft
WEB: http://icelandair.tripod.com/

ALASKA VIRTUAL AIRLINES
Based on the real world airline, Alaska Virtual Airlines and Horizon Virtual Airlines have one of the most realistic flight schedules found on the Internet utilising comprehensive flight schedules.
WEB: http://alaska_va.tripod.com/

AIR LINGUS
This airline is based on the real Aer Lingus airline. A must for Irish VA participants.
WEB: http://aer-avensis.hypermart.net/main.htm

KNIGHT AIR
This VA has three hubs in the UK and an extensive worldwide route network. They come highly recommended by their members.
WEB: www.knightair.org

BRITANNIA VIRTUAL AIRLINES
This VA is based on the real Britannia Airways, with hubs at Birmingham, Luton, Gatwick and Manchester, they also fly from another 14 UK airports.
WEB: http://BritanniaVA.worldzone.net

HAWAIIAN AIRLINES VA
A slightly different VA as it's for PC's and Macs but ONLY using PS1 or X-Plane. With a maximum of 16 pilots worldwide, Hawaiian is also pretty exclusive. Book him, Danno!
WEB: www.gorji.com/hawaii.html

EUROPEAN WORLD AIRWAYS
European World Airways is a new VA with hubs based at Heathrow and JFK the Airline serves Europe, the middle east and America, with their very own training facility.
WEB: www.europeanwa.cjb.net

SABENA VIRTUAL AIRLINES
Described as the 'official Sabena VA', working together with the real Sabena'. They have 30 pilots at the moment and have already won an award from Compuflight.
WEB: http://go.to/sabenava

AFRICAN EXPRESS (AFEX)
This is a VA operating a realistic and comprehensive network of schedules both within and out of Africa but based in South Africa. They're always looking for pilots so why not give them a look?
WEB: http://www.afex.co.za

WINGS INTERNATIONAL ALLIANCE
African Express, among others, are members of this group which is a collection of airlines from around the globe that allow pilots to fly just about anywhere whilst keeping things realistic.
WEB: http://members.xoom.com/wingsint

RAPID AIR INTERNATIONAL
With unique training services, long/ short haul flights, up to 20 hubs to choose from and so much information to offer, Rapid Air International boasts that they take the Virtual out of VA's!
WEB: www.rapidairinternational.co.uk

AFRICAN INTERNATIONAL AIRLINES
Heralded as Africa's premier Virtual Airline, they offer flights throughout the continent - from Cape Town to Cairo. The fleet includes a number of luxury Airbus and Boeing plus some smaller aircraft and rotorcraft.
WEB: www.evalunet.co.za/evalunet/aia/index.htm

ATLANTIC AEROSPACE CORPORATION
This virtual company includes the original Atlantic Skies Airline (circa 1996) and now Golden Airlines, Atlantic Charters and New England Express.
WEB: www.atlanticskies. com

DC3 AIRWAYS
This is a novel Virtual Airline that introduces virtual pilots to the DC3 and gives them an opportunity to fly this famous aircraft as authentically as possible.
WEB: www.dc3airways.com

EUROSTAR AVIATION
This VA describes itself as an award-winning Virtual Airline with an inclination to detail and professionalism.
WEB: www.eurostar-aviation.ch

If you have a virtual airline that is not listed here, the please feel free to send in a short description to mail@pcpilot.net where we will endeavour to include it in a future issue.